United States
Department of
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In cooperation
with the
Massachusetts
Water Resources
Commission

Upper Housatonic River Basin Study

Berkshire County Massachusetts

PREFACE

In June 1978, the Massachusetts Water Resource Commission requested the USDA, Soil Conservation Service to develop a plan of work for implementing the Massachusetts River Basin Planning Program. This plan of work was approved by the Massachusetts River Basin Field Advisory Committee and submitted to the Administrator of the Soil Conservation Service who approved the plan in January 1979. The intent of the Massachusetts River Basin Planning Program is to assist small groups of communities in working together to solve intertown or basinwide water and related land resource problems.

The Upper Housatonic River Basin is the second basin to be studied under this program. The Basin's water resource problems had been generally identified in the Berkshire Region Report of the Massachusetts Water Resources Study, a cooperative river basin study completed in 1978 and in the Water Quality Management Plan for the Upper Housatonic River Basin prepared in 1978 by the Berkshire County Regional Planning Agency. The Upper Housatonic study was requested by the Berkshire County Commissioners to provide a more in-depth analysis of resource problems in the Pittsfield area. Pittsfield along with the towns of Hinsdale and Lanesborough expressed an interest in resolving natural resource problems of common concern.

Under the authority of Section 6, Public Law 83-566, this study was conducted by agencies of the U.S. Department of Agriculture, including the Soil Conservation Service, Forest Service, and Economic Research Service. State agencies providing major contributions to the study were the Massachusetts Divisions of Water Resources and the Division of Fisheries and Wildlife. Many local officials and residents participated in inventory and advisory activities throughout the planning process. The Berkshire County Regional Planning Commission was particularly helpful during the study.

The Upper Housatonic River Basin, located in central Berkshire County, Massachusetts, is composed of 11 communities but only eight have significant portions of their area within the drainage area. The city of Pittsfield plus the towns of Hinsdale, Lanesborough, and Dalton account for 71 percent of the Basin area. The Basin covers about 92,600 acres or 144.7 square miles.

The average annual temperature is about 46°F, with record temperatures of 95°F for a high and a low of -25°F reported at the Pittsfield airport. The average annual precipitation is about 46 inches. Average monthly precipitation varies from a low of 2.5 inches in winter to a high of 4.9 inches in the summer.

Topography can be divided into a three-part physiographic system: the valley of the Housatonic River and its major tributaries, the highland area to the east, and the Taconic Range to the west.

The four principal Basin communities (Pittsfield, Dalton, Hinsdale, and Lanesborough) account for about 95 percent of the Basin's population of about 67,000. Although Berkshire County is primarily rural, the Upper Housatonic Basin is industrialized especially in and around Pittsfield. Forest land occupies about 76,000 of the Basin's 92,600 acres.

More detailed information concerning the Basin and its resource base may be found in Appendix A of this report.

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SUMMARY

This report focuses on the problems and concerns associated with the Upper Housatonic River Basin area (as described in Chapter 1). The concerns identified by local, county, and state officials include: Eutrophication of Lakes, Wetlands Protection, Groundwater Protection, Multiple Purpose Use of Lakes, Polychlorinated Biphenyls (PCBs), Water Supply, and Flooding.

In addressing these problems, USDA and cooperating agencies recommend a plan of action as presented in Chapter 2, along with a list of agencies, groups, and organizations that could take leadership to implement parts of the Recommended Plan (Chapter 3). Several alternative components that were considered during the evaluation process but not included in the Recommended Plan are discussed in Chapter 4.

The Appendices round out the report. Appendix A is devoted to Resource Base information such as climate, topography, soils, flood plains, prime farmland, water quantity and quality, population, and use of resources. Appendix B, the Wetland Inventory and Evaluation, presents the results of a study of the wetlands of the Basin. Appendix C is comprised of basic data and background analyses related to the lake eutrophication problem. Public participation during the course of this river basin study is discussed in Appendix D.

Eutrophication of Lakes appears to be an increasing problem in Berkshire County. Lakes are plagued with excessive weed growth that limits recreation potential. The weeds have been called a symptom of the high level of nutrients reaching the lake from sources in the watershed and from direct rainfall. The Berkshire County Regional Planning Commission's Water Quality Management Plan for the Upper Housatonic River (the 208 study) presented a detailed analysis of the phosphorus input to the five major lakes (Ashmere Lake, Onota Lake, Pontoosuc Lake, Plunkett Reservoir, and Richmond Pond) and concluded that "erosion-related" phosphorus contributed from 57 to 75 percent of the annual phosphorus input.

Although the 208 study identified "erosion-related"" phosphorus as the major phosphorus source, a better term might be "runoff-related" phosphorus, a term that includes erosion-related phosphorus and also the other phosphorus carried to the lakes by runoff. The field investigations conducted during this river basin study were directed toward a more detailed assessment of the runoff and erosion-related phosphorus situation.

Roadbank, roadbed, gully, streambank, and sheet and rill erosion were assessed in each lake watershed. From a field reconnaissance, it was decided to concentrate on sheet and rill erosion and streambank erosion. Gully, roadbank, and roadbed erosion were considered relatively insignificant in the total erosion picture in the Basin.

Utilizing an independent analysis procedure and updated land use information, this river basin study concluded that runoff-related phosphorus was indeed a significant percentage of the phosphorus being delivered to each lake. In addition, it was determined that erosion-related phosphorus from tilled cropland in the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond contributes a significant percentage of the runoff-related phosphorus delivered.

The Recommended Plan suggests that soil conservation practices be installed on cropland in the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond to reduce erosion rates and thus reduce nutrients delivered to the lakes. Conservation practices such as cover crops, contour planting, and the conversion of cropland to permanent pasture were evaluated as to their effect in reducing delivered phosphorus.

Animal waste is another agriculturally-related source of phosphorus that was considered by this study. Investigations confirmed that phosphorus from livestock waste contributes 5 to 8 percent of the annual phosphorus delivered to the three lakes (Onota Lake, Pontoosuc Lake, and Richmond Pond) that have significant concentrations of farm animals.

The Plan includes a recommendation that agricultural waste management practices be instituted on farms in the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond to reduce the amount of nutrients from animal waste delivered to the lakes.

Conservation practices to reduce erosion on cropland and better agricultural waste management will complement the Water Quality Management Plan for the Upper Housatonic River.

Wetlands Protection is an important concern because of the many valuable functions performed by wetlands. They can function as natural floodwater storage areas, provide habitat for a variety of plant and animal species, help maintain summer streamflow, serve as groundwater recharge areas, and provide recreational opportunities.

Loss and degradation of wetlands is a common concern throughout Massachusetts. The Wetlands Protection Act has been a major factor in reducing the wetland loss in the state. Because the Act is administered by the local Conservation Commissions, it is important that these people have accurate resource information available to enable them to make informed decisions concerning wetland values and significance.

This study endeavored to locate and identify the type and size of wetlands within the Basin and to evaluate the wetlands for various functions and uses. Seventy-eight wetland areas covering over 4000 acres were identified and evaluated.

The Recommended Plan suggests that public control be established on three particularly important wetland areas:

1. Town Brook wetlands, in Lanesborough
2. Center Pond wetlands, in Dalton
3. Quaking Bog, in Hinsdale

Acquisition or other control of these wetlands is recommended to insure that they will be protected from unwise development and will be available for public use and enjoyment.

Groundwater Protection was identified as a concern since communities within the Basin exhibit increasing interest in groundwater as a source of municipal water supply. The ability of groundwater aquifers to meet water supply needs and the protection of groundwater quality are of special concern.

Definitive groundwater testing programs much beyond the scope of this study have been conducted on aquifers in Dalton and Pittsfield. Less detailed studies of the Secum and Daniels Brook aquifers in Lanesborough and Pittsfield have been made.

Detailed information is presented in this study concerning the Town Brook, Secum Brook, and Daniels Brook aquifers.

Lanesborough is the only community in the Basin that is currently drawing municipal supply from groundwater. Due to Lanesborough's dependence on groundwater and the studies underway or completed for other Basin aquifers, the river basin study undertook to define the potential of the major Lanesborough aquifers and to identify specific hazards to groundwater quality.

Implementation of a program to protect the water quality in the Town Brook aquifer is recommended. Such a plan would consist of enactment and enforcement of a groundwater protection bylaw to limit potentially hazardous land uses from threatening the quality in an aquifer that has potential to meet all of Lanesborough's water supply needs for the foreseeable future. Limitations on the application of roadway salt in critical aquifer recharge areas are also suggested.

Multiple Use of Lakes can create multiple conflicts between users. The Basin has five major multi-purpose lakes (Ashmere Lake, Onota Lake, Pontoosuc Lake, Plunkett Reservoir, and Richmond Pond) which are used for a variety of purposes including water supply, fish and wildlife habitat, flood control, aesthetics, streamflow augmentation, boating, swimming, and fishing. These uses can conflict and result in less than optimum use of the water resource.

A series of public meetings and discussions with local, county, and state agencies identified several areas of concern and conflict at each lake. Perhaps the most common area of conflict involves the regulation of the lake level. Recreation interests prefer a maximum water level while downstream flood control and winter dam safety considerations favor lowering the lake levels for a portion of the year. The report discusses various lake level options and presents alternatives for consideration.

The Plan recommends establishment of Lake Management Advisory Groups composed of representatives of each interest group concerned with the use and operation of each lake.

Polychlorinated Biphenyls (PCB's) are a water quality problem in the Basin. No investigations were made by this study into the topic of PCB's. The sole purpose of including PCB's in the list of problems and concerns was to acknowledge a potentially serious situation and to encourage comprehensive study of the subject.

Water Supply is being addressed in detail by the U.S. Army Corps of Engineers as part of their Urban Study of the Housatonic River Basin in Massachusetts and Connecticut. Study participants provided the Corps with detailed information concerning potential reservoir sites in the entire Massachusetts portion of the Housatonic River Basin.

An update of a previous SCS inventory of potential reservoir sites is included in Chapter 4 - Alternatives. Some of the reservoir sites in the Upper Housatonic Basin offer potential to meet local needs. Local interest is currently focused on groundwater to meet municipal needs but the surface reservoir option should not be totally dismissed.

Flooding is also a topic of local concern that is being addressed in detail by the Corps of Engineers as part of the Urban Study of the Housatonic River. The Soil Conservation Service provided the Corps with detailed flood damage information as well as hydraulic data compiled in earlier flood hazard studies of the Upper Housatonic River Basin. To avoid duplication of effort, no investigations of flooding were conducted in this study.

CHAPTER 1

PROBLEMS AND CONCERNS

CHAPTER 1

PROBLEMS AND CONCERNS

Discussions with community officials from Pittsfield, Lanesborough, and Hinsdale; the Berkshire County Commissioners; Berkshire Regional Planning Commission personnel; other local, county, and state officials; as well as members of the public resulted in the identification of several specific concerns in the area of water and related land resources including:

- Eutrophication of lakes
- Protection of wetlands
- Groundwater protection
- Multiple use of lakes
- Polychlorinated biphenyls
- Water supply
- Flooding and flood damages

Each of these concerns and the problems associated with them are discussed in detail in this chapter.

Eutrophication of Lakes

Lakes in Berkshire County are plagued with excessive weed growth which severely limits their recreation potential. The weeds snag boat propellers and fishing gear, as well as making swimming unpleasant. The weeds have been called a symptom of the high level of nutrients reaching the lake from sources in the watershed and from direct rainfall.

Aquatic plants need nutrients to grow, and plant growth can therefore be controlled by management of these nutrients. Nitrogen and phosphorus are the two major nutrients usually considered for such a management program. Phosphorus is usually selected over nitrogen as the more suitable for a control program but reduction of the supply of either element to the point where it is the element limiting plant growth will allow similar results. Phosphorus management, entails controlling much smaller quantities to achieve the same reductions in plant growth than a nitrogen program would since aquatic plant growth requires 14 times more nitrogen than phosphorus.

The Berkshire County Regional Planning Commission's Water Quality Management Plan for the Upper Housatonic River (the 208 study) presented a detailed analysis of the yearly phosphorus input to the five major multipurpose lakes in the Basin. These phosphorus estimates are presented in Table 1-1.

Table 1-1

Annual Phosphorus Loading by Source to Selected Lakes

Lake, Pond or Reservoir	Phosphorus Supplied to Lake (Base Year - 1976)1/										
	Erosion		Atmosphere on Lake		Septic Systems		Livestock		Other		Total
	Kg	Percent	Kg	Percent	Kg	Percent	Kg	Percent	Kg	Percent	Kg
Ashmere	308	72.1	66	15.5	51	11.9	0	-	2	0.5	427
Onota	705	70.7	187	18.8	20	2.0	75	7.5	10	1.0	997
Plunkett	140	74.9	22	11.8	16	8.6	0	-	9	4.8	187
Pontoosuc	953	56.9	146	8.7	384	22.9	93	5.6	98	5.9	1674
Richmond	479	64.7	66	8.9	127	17.2	56	7.6	12	1.6	740

1/ Data from: Berkshire County Regional Planning Commission, Water Quality Management Plan for the Upper Housatonic River Final Plan/EIS, September 1978.

The 208 study estimates identified erosion as the major source of the phosphorus supplied annually to the five lakes. As a result, the field investigations conducted during this River Basin study were directed toward more detailed assessments of the erosion situation.

A field reconnaissance of each lake watershed was made with the assistance of the Sedimentation Geologist from the SCS National Technical Center to evaluate erosion potential. Roadbank, roadbed, gully, streambank and sheet and rill erosion were assessed in each watershed.

From the reconnaissance, it was decided to concentrate on sheet and rill erosion and streambank erosion. Gully, roadbank, and roadbed erosion were considered relatively insignificant in the total erosion picture.

Field investigations were made to gather data necessary to compute sheet and rill erosion using the Universal Soil Loss Equation. The equation is widely used to estimate annual erosion rates.

Nearly all tilled crop fields were visited and data obtained on an individual field basis concerning slope length, cover factors and practice factors needed for the Universal Soil Loss Equation. Significant tilled cropland acreages were found in three watersheds; the Pontoosuc Lake Watershed contains 276 acres; Onota Lake Watershed - 230 acres, and the Richmond Pond Watershed - 169 acres. For other land uses, a sampling procedure was used to determine average slope, cover, and practice factors.

A current land use map of each watershed was overlaid with a soils map and a computer mapping program used to determine the percentage of each land use located on a specific soil type.

Erosion estimates were calculated by use of the SCS Sediment Delivery (SEDEL) computer program. The SEDEL program computes erosion rates by use of the Universal Soil Loss Equation for any combination of land use, soil type, cover factor, slope, slope length, practice factor, and rainfall factor. The Universal Soil Loss Equation could be computed manually with the same results; the computer program merely eliminates the need for hundreds of repetitive calculations. The SEDEL program multiplies the erosion rate estimate by the acreage in a particular category to arrive at a total erosion estimate for each land use and for the total watershed.

Sediment delivery ratios (the percent of erosion that ultimately is delivered to a water body) of 15 to 23 percent were determined utilizing standard relationships of delivery ratio to drainage area contributing sediment. The selected delivery ratio was used in the SEDEL program to convert the sheet and rill erosion estimate to a delivered sediment estimate for each watershed.

Streambanks of major tributary brooks were walked and erosion areas measured. Streambank recession rates were estimated by taking into account the amount of exposed roots, fallen trees, as well as verbal accounts from people in the area.

Streambank erosion, in general, was found not to be a significant source of sediment to the lakes but individual critical areas are contributing excessive amounts of sediment.

Table 1-2 presents the results of the erosion and sediment investigations.

Although the 208 study identified "erosion-related" phosphorus as the major source that delivered phosphorus to the five lakes, a better term might be "runoff-related" phosphorus; a term that includes erosion (or sediment) related phosphorus and also other phosphorus delivered to the lake as a result of runoff of precipitation.

It appears that the 208 study intended the erosion-related phosphorus estimate to include all runoff-related phosphorus. The Universal Soil Loss Equation, referred to on page 96 of the 208 report is used to predict erosion, but assigns the highest cover factor (and thus the highest erosion rate) to urban land. This is a method of accounting for the higher phosphorus production expected from urban land in the form of dust, debris, domestic (animal) waste, and "the discarded residues of civilization." Use of the Universal Soil Loss Equation to predict solely erosion would need to consider that the urban land surface is usually covered with streets, paved driveways, parking lots, roofs, lawns, and other permanent vegetative cover. Hence, erosion expected from urban land would be extremely low.

Conversion of undeveloped land to urban land can often produce large quantities of erosion while construction is underway and until the site is stabilized. If significant amounts of construction were underway, then erosion rates for urban land would be much higher. However, during the field investigation phase of this study, little or no construction activity was observed in the lake watersheds and the erosion and sediment estimates for urban land reflect this no-construction condition.

Table 1-2

Erosion and Sediment Estimates

	Ashmere Lake			Onota Lake			Plunkett Reservoir			Pontoosuc Lake			Richmond Pond		
Erosion Source	Area (acres)	Annual Erosion (tons)	Annual Sediment (tons)	Area (acres)	Annual Erosion (tons)	Annual Sediment (tons)	Area (acres)	Annual Erosion (tons)	Annual Sediment (tons)	Area (acres)	Annual Erosion (tons)	Annual Sediment (tons)	Area (acres)	Annual Erosion (tons)	Annual Sediment (tons)
Land Use															
Cropland	0	0	0	230	1033	186	0	0	0	276	4589	688	169	597	113
Pasture	9	1	0	404	41	7	9	3	1	2132	282	42	490	53	10
Forest	1786	135	30	4437	612	111	1575	162	39	8204	1095	165	2867	330	63
Urban	313	20	4	505	23	4	77	5	1	962	144	22	570	46	9
Other, Idle	150	10	2	313	29	5	74	18	4	1217	167	25	380	49	9
Non-Sediment Contributing (Water, Wetlands)	297	0	0	740	0	0	215	0	0	1072	0	0	782	0	0
Streambanks															
Eroding		17	8		18	6		0	0		77	26		18	9
Total	2555	182	44	6629	1756	319	1950	230	45	13863	6277	942	5258	1093	213

Previous studies have indicated that runoff-related phosphorus can be estimated by attributing phosphorus delivery rates to various land uses. Table 1-3 indicates the delivery rates selected to develop the estimates for this study.

Table 1-3

Runoff-Related Phosphorus Delivery Rates

Land Use	Delivery Rate
	(grams of phosphorus/acre)
Forest	20
Pasture	35
Tilled Cropland	250 1/
Urban	450
Other	200
Non-Sediment Producing (Wetlands)	180

Source: Soil Conservation Service Technical Note 23.

1/ Adjusted to 510-1800 g/a in high erosion rate areas.

Water quality sampling data discussed in Appendix C and investigations made in the Massachusetts Agricultural Water Quality Study indicate that erosion-related phosphorus amounts to about 1.5 pounds of total phosphorus (0.68 kilograms of total phosphorus) per ton of sediment delivered to the lakes. Using the phosphorus delivery rates from Table 1-3 and the land use acreages from Table 1-2, runoff-related phosphorus estimates were developed. Erosion-related phosphorus estimates were developed from the sediment data in Table 1-2.

Since the phosphorus delivery rates in Table 1-3 are based on average runoff conditions and do not reflect the steep slopes and higher erosion rates in Berkshire County, runoff-related phosphorus figures for areas with high erosion rates were adjusted to compensate for increased erosion-related phosphorus in the total runoff-related number.

Estimates of runoff and erosion-related phosphorus are presented in Table 1-4.

Table 1-4

Runoff and Erosion-Related Phosphorus Estimates
(kilograms of total phosphorus)

Area	Ashmere		Onota		Plunkett		Pontoosuc		Richmond	
	Runoff	Erosion	Runoff	Erosion	Runoff	Erosion	Runoff	Erosion	Runoff	Erosion
Cropland	0	0	140	126	0	0	520	468	86	77
Pasture	0	0	14	5	1	1	75	29	17	7
Forest	36	20	89	75	32	27	164	112	48	43
Urban	141	3	227	3	35	1	433	15	257	6
Other	30	1	63	3	15	3	243	17	76	6
Non-Sediment Producing	8	0	22	0	26	0	109	0	100	0
Streambanks	5	5	4	4	0	0	18	18	6	6
Total	220	29	559	216	109	32	1562	659	590	145

Given the many variables entering into these two independent analyses of runoff-related phosphorus, the two estimates agree quite well especially when viewed in the context of lake trophic status.

Using a procedure developed by Dillon that utilizes Vollenweider's total phosphorus loading versus the mean depth to renewal time ratio, trophic states were calculated with the 208 data from Table 1-1 of this report and also calculated by substitution of runoff-related phosphorus estimates of the study for the 208's erosion-related phosphorus estimate in Table 1-1.

Table 1-5 presents a comparison of the 208 study runoff-related phosphorus estimates and those developed during the course of this river basin study.

Table 1-5

Comparison of 208 Study (1976) and River Basin Study
Runoff-Related Phosphorus Estimates for Five Lakes

Lake	Runoff-Related Phosphorus (Kilograms)		SCS Estimates as a Percent of the 208 Estimate
	208	SCS	
Ashmere	308	220	71
Onota	705	559	79
Plunkett	140	109	78
Pontoosuc	953	1562	164
Richmond	479	590	123

Results indicated that the trophic state of all five lakes is predicted to be within the same range using the original 208 data and the river basin study data even with the differences in data as depicted in Table 1-5.

Even though the numeric data are different, the conclusions as to trophic state appear reasonably similar. Likewise, the river basin study agrees that runoff-related phosphorus is the primary component of the phosphorus inputs to the lakes.

Table 1-6 indicates the percentage of runoff-related phosphorus contributed by erosion in each land use category.

Table 1-6

Percentage of Runoff-Related Phosphorus from Erosion in Various Land Use Classes

Runoff-Related Phosphorus Source	Ashmere	Onota	Plunkett	Pontoosuc	Richmond
Cropland	0	23	0	30	13
Pasture	0	1	1	2	1
Forest	9	13	25	7	7
Urban	1	1	1	1	1
Other	0	1	3	1	1
Streambanks	2	1	0	1	1

Table 1-6 illustrates that reduction of erosion on tilled cropland in the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond will reduce a significant percentage (13 to 30 percent) of the runoff-related phosphorus being delivered to the lakes.

To avoid overemphasizing the phosphorus contribution from cropland erosion it is useful to remember that runoff-related phosphorus from urban areas represents 28 to 44 percent of the total runoff-related phosphorus delivered to the three lakes. However the erosion-related component of urban runoff-related phosphorus is negligible.

Phosphorus from erosion on forest land represents a notable percentage of the runoff-related phosphorus. However, this is attributable to the fact that forest land is by far the most prevalent land use category, rather than being a result of excessive erosion as is the case with tilled cropland.

Another source of agriculturally-related phosphorus is that contained in animal waste. Table 1-7 presents data from the "208" Water Quality Management Plan for the Upper Housatonic River and corresponding estimates by the Soil Conservation Service of the quantity of phosphorus contributed to each of the lakes from farm animals.

Table 1-7

Annual Phosphorous Loading from Livestock

Lake	Kilograms 208 Estimate (1976)	SCS Estimate (1981)	Remarks
Pontoosuc	93	67	
Onota	75	46	
Richmond	57	56	
Ashmere	0	0	Insignificant number of animals.
Plunkett	0	0	Insignificant number of animals.

The estimates are in good agreement and substantiate the 208 contention that farm animals contribute from 5 to 8 percent of the annual phosphorus delivered to the three lakes with significant farm animal concentrations.

Wetlands

Wetlands are those areas of land where the water table is at or near the ground surface for much of the year and which are subject to occasional flooding. Wetland areas are important because they can: function as natural floodwater storage areas, provide habitat for a variety of plant and animal species, help maintain summer streamflow, serve as ground water recharge areas, and provide recreational opportunities such as fishing, hunting, trapping, and nature study.

The important and varied functions of wetlands have been recognized by Massachusetts government and legislation has been enacted to protect wetlands against unwise development. The Massachusetts Wetlands Protection Act (Massachusetts General Laws, Chapter 131, Section 40) has been a major factor in reducing the rate of wetland loss throughout the state. The Act has been especially important in eastern Massachusetts where there are more wetlands and much more development pressure than in the Upper Housatonic Basin.

The Act is administered by the Conservation Commission in each city or town and the effectiveness of the Act depends primarily upon the views of the individuals who comprise the Commissions. If the members respond to pressure for development, the wetland resource can be compromised for future generations. If the members consider themselves as "advocates" for the wetlands, then wetlands will only be altered when the tradeoffs result in undeniable positive benefits to the community. The Wetlands Protection Act provides some flexibility to permit a municipality to exercise some local judgment, and consider local values and priorities in accepting or rejecting wetland alteration. Weighed against the benefits derived from local control is the danger that intense local pressure for economic development may result in the Conservation Commission accepting wetland alterations that are not in the

community's best long-term interest. Likewise changes in the composition of personnel on the Conservation Commission (members are appointed, not elected) can result in changes in philosophy regarding the importance of wetland protection.

Although the Massachusetts Department of Environmental Quality Engineering maintains an oversight function in the wetland protection process and can overrule the local decisions through an appeal, the Conservation Commission remains the first line of wetland defense. It is important that the Conservation Commission members have accurate resource information available to enable them to make informed decisions concerning wetland values and significance.

To meet the need for accurate information, this study sought to locate and identify the type and size of wetlands within the Basin and to evaluate the existing and potential functions and values of these wetlands.

Wetlands were mapped on 1:25000 scale USGS topographic maps with the exception of those in Hinsdale and Lanesborough. These towns were participating in the Natural Resource Planning Program that resulted in a series of maps at 1:12000 scale.

Wetlands were initially identified through use of the Massachusetts Mapdown Cover and Land Use Maps and transferred to topographic maps. In addition, poorly drained and very poorly drained soils (often a good indicator of wetland areas) were identified on soil map field sheets and also transferred to topographic maps. Seventy-eight wetlands were identified within the Basin. Those 78 wetlands cover over 4000 acres.

A field visit to each wetland area thus identified provided the means to classify each site as to vegetative composition and evaluate their significance for fish and wildlife habitat, boating, shoreline fishing, nature study, waterfowl hunting, uniqueness, and visual quality using a procedure developed by the Soil Conservation Service.

A wetlands map, results of the wetland evaluation, and a sample wetland evaluation form are located in Appendix B of this report. In addition, Appendix B contains an evaluation of 16 of the major wetland areas as wildlife habitats. This evaluation was prepared by the Massachusetts Division of Fisheries and Wildlife.

These evaluations should be of value to the local Conservation Commissions in documenting wetland significance and in assessing the impacts involved if wetland degradation is permitted.

Effective April 1, 1983, new Wetland Protection Act Regulations go into effect under 310 CMR 10:00. The Regulations are pursuant to the rulemaking authority set forth in the Act and strengthen administration of the Act and protection of wetland areas. Areas subject to protection include any bank, freshwater wetland, coastal wetland, beach, dune, flat, marsh or swamp bordering on the ocean, an estuary, a creek, a river, a stream, or pond or lake. Also included is land under any water beds, land subject to tidal action, land subject to coastal storm flowage, or land subject to flooding.

The new regulations presume that activities within areas subject to protection under the Act are so likely to result in the removing, filling, dredging or altering of those areas that preconstruction review is always

justified and a Notice of Intent is required. For buffer areas within 100 feet of an area subject to protection, the developer must ask the Conservation Commission for a determination as to whether the proposed activity will alter the protected area. Outside the protected areas and their buffers, review and regulation are not permitted until the activity actually results in an alteration of the protected area.

A proponent of wetland alteration has the burden of demonstrating that the area is not significant to the protection of any interest identified in the Act or that the proposed work will contribute to protect those interests.

Most importantly, when a proposed activity involves the removal, filling, dredging, or altering of land under protection of the Act, the presumption is rebuttable, but the Conservation Commission must clearly identify that the area does not play a role in protecting the interest of the Act.

In addition, where the presumptions are not overcome, any proposed work must meet strict performance standards specifying the intended result of any restrictive conditions imposed on the proposed work.

Groundwater Protection

Communities in the Upper Housatonic River Basin are evidencing increasing interest in groundwater as a source of municipal water supply. The ability of groundwater aquifers to meet water supply needs and the protection of the aquifers from degradation have been identified as items of concern.

Definitive groundwater testing programs have been conducted by consultants on the Dalton aquifer and Vincent Farm-Brattle Brook aquifer. Less detailed studies have been carried out on Secum and Daniels Brook aquifers in Lanesborough and Pittsfield. Regional groundwater summaries have been published by the U.S. Geological Survey, research groups, and by the Berkshire County Regional Planning Commission (BCRPC) in the "208" Water Quality Management Study.

Recent studies contracted by BCRPC have addressed the potential for high-yield bedrock wells as well as reevaluating the Vincent Farm-Brattle Brook aquifer. The study also makes additional recommendations on the Secum-Daniels Brook aquifers in terms of additional supply.

Testing of the Dalton aquifer by Tighe & Bond, Inc. indicated that an existing landfill located within the aquifer limits does not adversely affect groundwater quality. Since the testing, a second municipal landfill was sited in the aquifer area. Potential for groundwater pollution has become greater and the possible use of the aquifer as a viable groundwater source has been diminished.

Long duration pumping studies of the Dalton aquifer would be required to determine its suitability for water supply. Structural measures might be necessary to protect the aquifer from pollution from the landfills.

Of the communities in the Upper Housatonic Basin, Lanesborough is the only town currently drawing municipal supply from groundwater. Due to Lanesborough's dependence on groundwater and the definitive studies underway or completed for other basin aquifers, this study undertook to define the potential of the major Lanesborough aquifers and to identify specific hazards to water quality.

Within the Pontoosuc Lake Watershed, there are two major sand and gravel aquifers designated as the Town Brook and Secum Brook aquifers. Figure 1-1 indicates the general location of the aquifers and their recharge areas. Boundaries are based on soils maps, geology reconnaissance and previous geologic maps of the area (Holmes unpublished).

Town Brook aquifer is currently being used by the town of Lanesborough as a municipal supply. Secum Brook was rated as having high potential yield by the "208" study. Both aquifers are rated as having high potential for water supply although the Secum Brook aquifer has not been fully proven by drilling and pump testing.

Geologic maps prepared by USGS in Hydrologic Atlas #281 and by Holmes (unpublished) indicate a linear strip of stratified drift extending down the Town Brook valley. This area is shown on Figure 1-1. The stratified drift is composed of sands and gravels laid down by glacial meltwaters. Norvitch et al., 1968, indicate the Town Brook valley is underlain by up to 150 feet of these sands and gravels. Thickness of the deposits is likely to be greatest nearer the lake and toward the middle of the valley Non-stratified glacial till covers the hill slopes to the watershed boundaries. Runoff from the glacial till is greater than that of the highly permeable stratified sands and gravels in the valley. As a result, the glacial till acts to channel runoff to the valleys, where rapid infiltration to the aquifer takes place.

The valley which Town Brook occupies is underlain by dolomitic rocks, which have likely developed a solutional porosity along fractures by development of open cavities and channels. A bedrock aquifer underlying the surficial sand and gravel aquifer may be present, but has not been explored.

The town of Lanesborough has sited two municipal wells in the Town Brook aquifer. Current usage is about 210,000 gallons per day. The capacity of these two wells is reported at a maximum of 2.0 mgd, far in excess of daily consumption.

The "208" Water Quality Management Plan for the Upper Housatonic River indicates that the major hazard to the Town Brook aquifer is highway salting and urbanization of the recharge area.

The U.S. Public Health Service limit for chloride in drinking water is 250 milligrams/liter (mg/l). The water is not harmful at this chloride concentration but tastes brackish. The recommended sodium limit is 20 mg/l. Sodium levels in Lanesborough well #1, north of Bridge Street, from 1973 to 1979 were nearly constant at about 4 mg/l. In the years since 1979, a threefold increase in sodium concentration has taken place. Chloride concentrations have shown a steady upward trend since 1978 giving preliminary indications of a coming increase in sodium concentrations.

Urbanization in the aquifer area can cause groundwater quality deterioration. One of the potential impacts is the accidental spillage of gasoline or fuel oil in the recharge area. A second, lesser threat and concern for aquifer protection are housing density and septic tank effluent. Nitrate and nitrites from septic tanks can pollute groundwater.

The Secum Brook aquifer lies in a watershed which is tributary to Pontoosuc Lake from the west. The aquifer has not been investigated adequately.

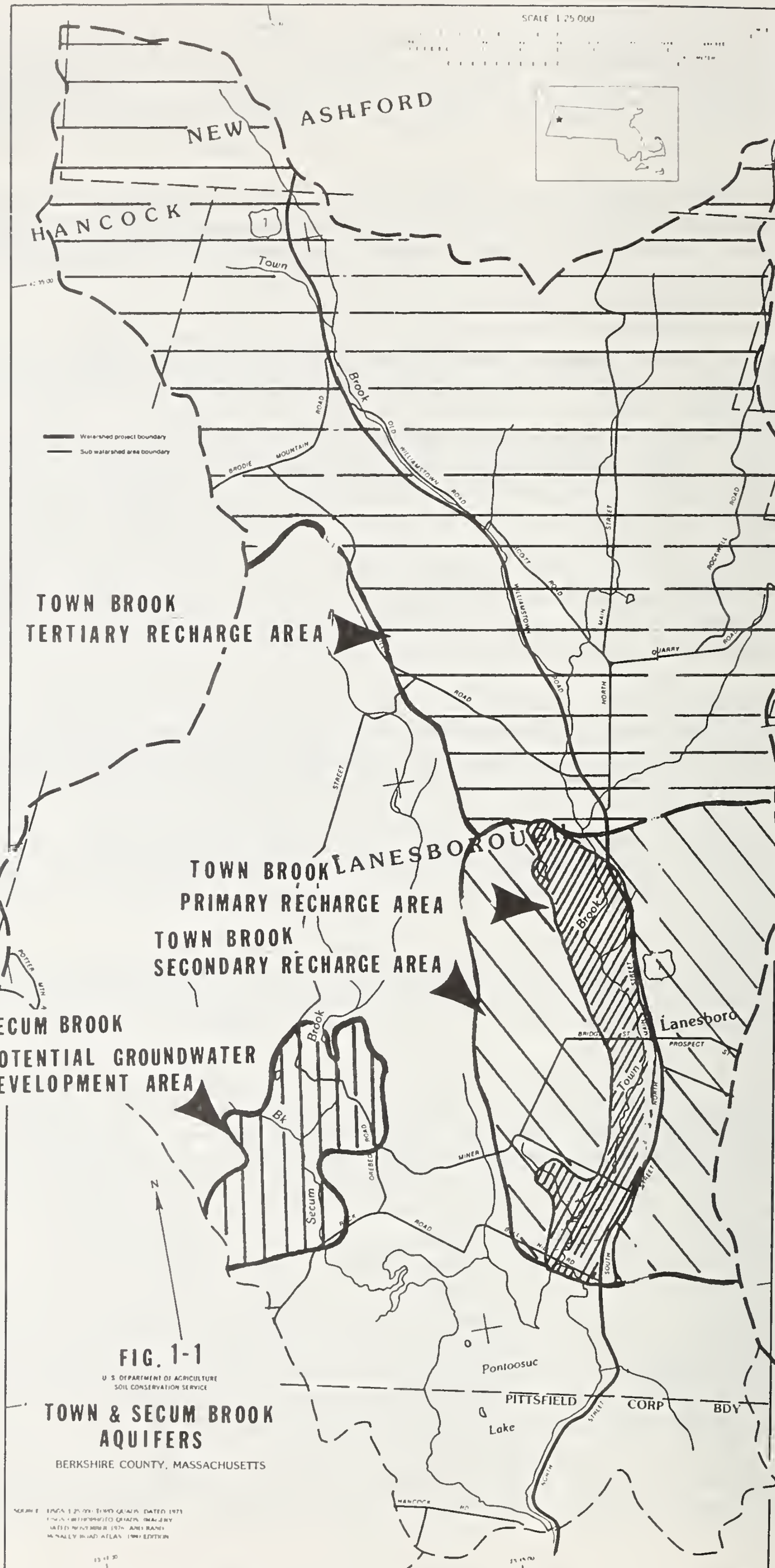


FIG. 1-1

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TOWN & SECUM BROOK AQUIFERS

BERKSHIRE COUNTY, MASSACHUSETTS

Previous reports by USGS in Hydrologic Atlas (#281 indicate potential for water supply in the Secum Brook Watershed. Metcalf and Eddy (1966) performed borings and pump tests which indicated poor water yielding characteristics in a portion of the aquifer. Stratified sands and gravels observed in gravel pits south of the Lanesborough landfill are coarse grained. These layers could be encountered below the water table where they would provide suitable water supply. Ice contact deposits such as these exhibit rapidly changing grain sizes both laterally and vertically. The potential for waterbearing zones depends on locating a highly transmissive gravel layer in the subsurface.

At present no municipal pumpage is taken from this aquifer. Pumpage is limited to several private wells. Since currently there is no operating municipal well located in the aquifer, any hazards located would affect placement of future supplies. The greatest hazard in the aquifer is the former Lanesborough landfill. The garbage was landfilled in an area of sandy, gravelly ice contact, stratified drift deposits, directly in a primary recharge area of the aquifer.

Field observations in the summer of 1981 revealed reddish-brown leachate issuing into Secum Brook, immediately east of the landfill. It appears that groundwater gradients flow to the brook from the landfill.

Other potential hazards include gravel mining of the gravelly kame terrace deposits east of the former landfill and agriculturally related pollution from farms in the watershed. Of these hazards the former landfill site presents the greatest potential for groundwater pollution.

Within the Onota watershed there is one potential sand and gravel aquifer, the Daniels Brook aquifer illustrated on Figure 1-2. Aquifer and recharge area boundaries are based on soils maps, surficial geologic reconnaissance, and unpublished geologic maps of the area.

The Daniels Brook aquifer area is not presently used for municipal water supply. The area was investigated by Metcalf and Eddy in 1966 and found to have poor water yielding characteristics, but the aquifer has not been fully investigated for water supply.

USGS Hydrologic Atlas #281 indicates that potential exists for municipal supply in the watershed. Ice contact stratified drift in the aquifer is much the same as that found in the Secum Brook aquifer. A municipal supply depends upon locating favorable water yielding zones in the sands and gravels.

There is presently no municipal pumpage from the aquifer and there are no apparent hazards to potential development of a supply.

Table 1-8 presents estimates of long-term yield from watersheds using a modification of the procedure in the U.S. Geological Survey publication, "Water Resources Inventory of Connecticut, Part 8, Quinnipiac River Basin," Mazzaferro et al., 1979.

For each watershed indicated, the areas of glacial till, silty and swampy soils, and stratified drift were identified and the percent of the area underlain by stratified drift calculated. The groundwater outflow was calculated as a percent of the mean annual runoff using a linear regression formula developed by USGS based on the data of 28 basins in New England.

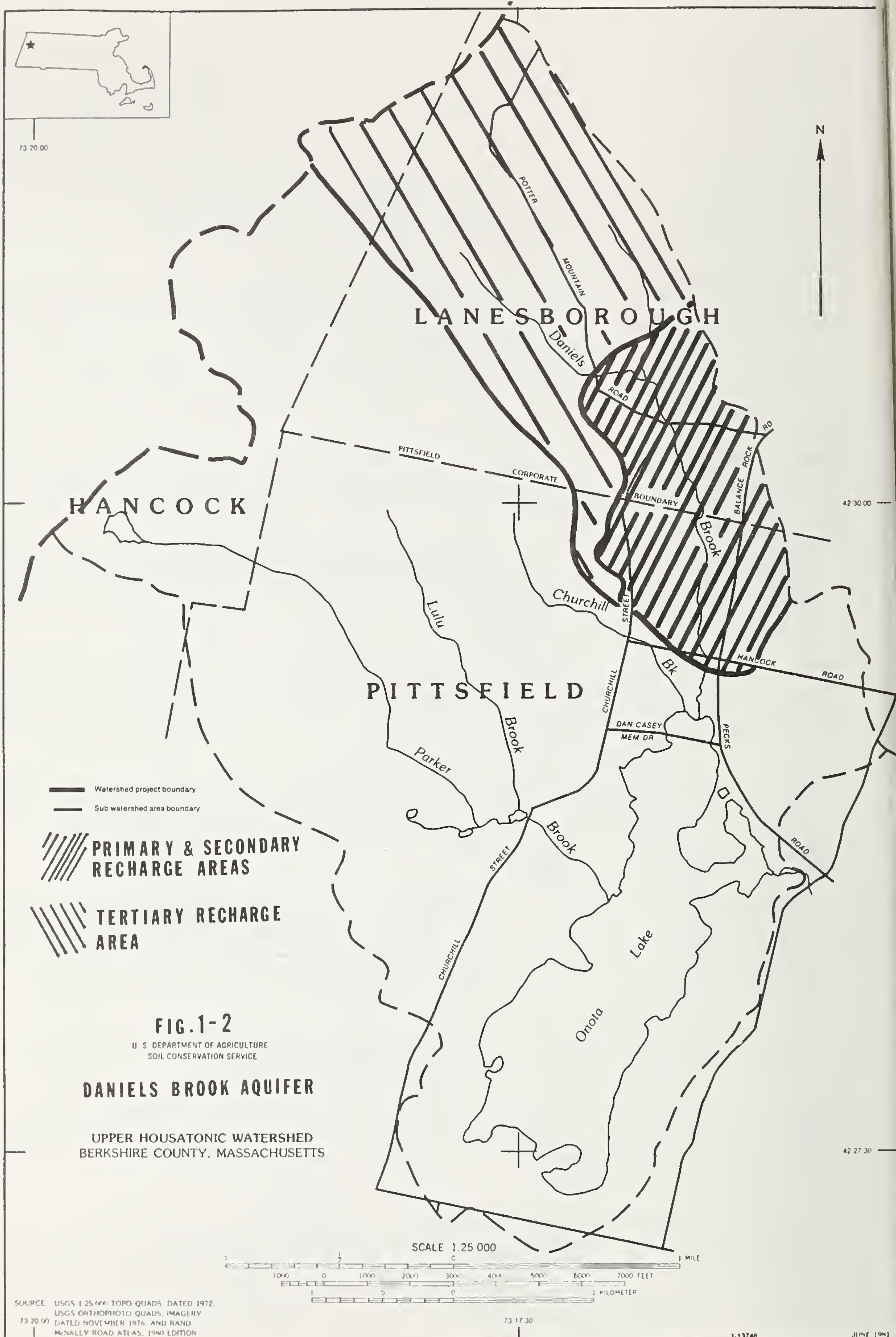


FIG. 1-2

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DANIELS BROOK AQUIFER

UPPER HOUSATONIC WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

TABLE 1-8

Estimated Long-Term Yields from Favorable Groundwater Areas*

Watershed	Percent of Area Underlain by Stratified Drift	Groundwater Outflow Equaled or Exceeded 7 Years in 10 (MGD)	Flow of Principal Streams Entering Favorable Area Equaled or Exceeded 90% of the Time (MGD)	Estimated Maximum Amount of Water Available Over a Long Time Period[1/] (MGD)	Installed Pumping Capacity
Town Brook	30	2.0	1.0	2.5	0.65
Secum Brook	56	.82	.86	1.7	nil
Daniels Brook	77	.58	.6	1.2	nil

*Procedure modified from USGS Mazzaferro et al., 1979.

The average annual groundwater outflow and the groundwater outflow equaled or exceeded 7 years out of 10 was calculated. Seventy-five percent of this value was estimated to be available for capture by municipal wells.

The 90 percent duration flow of the stream which is in hydrologic contact with the aquifer was also computed assuming that drying up the stream by induced infiltration more than 10 percent of the time is undesirable. The flow duration chart used to arrive at this figure is from Mazzaferro et al. (1978).

The estimated maximum amount of water available over a long-term period in million gallons per day is provided in Table 1-8. Where induced recharge from streams is not likely, only the 7 out of 10 year groundwater outflow is available to wells. Estimates of water available assume a well would be located at the discharge or furthest downstream point in the watershed.

Multiple Use of Lakes

There are five major multi-purpose bodies of water within the Upper Housatonic River Basin:

Table 1-9

Multi-purpose Ponds, Lakes, and Reservoirs

Name	Approximate Surface Area (acres)
Ashmere Lake	250
Onota Lake	620
Pontoosuc Lake	480
Plunkett Reservoir	70
Richmond Pond	230

These lakes are truly multi-purpose and are used for a variety of purposes including water supply, fish and wildlife habitat, flood control, aesthetics, streamflow augmentation, boating, swimming, and fishing. The various uses can conflict and result in less than optimum use of the resource. Table 1-10 illustrates some of the potential conflicts between various uses of a water body. These conflicts can be reduced to some extent by good management techniques, coordination, cooperation, and often by some relatively simple, low-cost measures.

As a result of a series of public meetings and discussions with state, local, and regional agencies, specific conflicts in lake use have been identified as follows:

Ashmere Lake - Use of the lake by water skiers and large power boats was identified as a concern by lakeside residents. It has been reported that those uses interfere with the enjoyment of the lake by anglers, canoeists, swimmers, and those seeking quiet and solitude.

Table 1-10

Potential Conflicts Between Uses at Existing Reservoirs

	Primary Municipal Water Supply	Emergency Municipal Water Supply	Flood Prevention (Permanent Drawdown)	Flood Prevention Drawdown Upon Flood Warnings and in Winter)	Cold Water Fishery	Warm Water Fishery	Swimming	Boating (Water Skiing)
Emergency Municipal Water Supply	No conflict in ultimate use. Water utilized for primary municipal water supply obviously will not be available in an emergency.	Identical use						
Flood Prevention (Permanent Drawdown)	Conflict. The volume of water drawn down for flood prevention will no longer be available for primary municipal water supply use.	Conflict. The volume of water drawn down for flood prevention will no longer be available for emergency municipal water supply use.	Identical use					
Flood Prevention (Drawdown upon flood warnings and in winter)	Potential conflicts. Managers might be reluctant to implement drawdown if water supply was critical. However, if flood warnings are accurate, drawdown volume will be replenished with floodwater.	Potential conflicts. Managers might be reluctant to implement drawdown if water supply was critical. However, if flood warnings are accurate, drawdown volume will be replenished with floodwater.	No conflict. Site would be utilized for flood prevention.	Identical use				
Cold Water Fishery	Potential conflicts. Significant drawdown for water supply might alter temperature characteristics of lake and adversely affect fishery. Fishing use must be managed to protect water quality.	Potential conflicts. Significant drawdown for water supply might alter temperature characteristics of lake and adversely affect fishery. Emergency water supply will probably be needed during warm weather period that is critical to cold water fishery survival.	Potential conflicts. Drawdown for flood prevention might alter temperature characteristics of lake and adversely affect fishery. Higher summer water temperature and lower winter oxygen availability may be problems for fishery.	Potential Conflicts. Drawdown for flood prevention might alter temperature characteristics of lake and adversely affect fishery. Winter oxygen availability may be problem for fishery.	Identical Use			
Warm Water Fishery	Potential conflicts. Fishing use must be managed to protect water quality. Significant drawdown for water supply use could adversely impact fishery.	Potential conflicts. Significant drawdown for water supply use could adversely impact fishery.	Potential conflicts. Significant drawdown for flood prevention could adversely impact fishery.	Potential conflicts. Significant drawdown for flood prevention could adversely impact fishery. Drawdown for flood prevention might be required at inopportune time resulting in less of fish eggs.	Inter-species competition will occur.	Identical use		
Swimming	Conflict. Normally considered incompatible uses in Mass.	Conflict during time lake is being used for water supply. Compatible uses possible at other times.	Potential conflict. Size of the swimming area will be decreased	Minimal conflicts. Significant drawdown would reduce size of swimming area. Beach modification might be necessary.	No significant conflicts in most cases.	No significant conflict in most cases.	Identical use	
Boating (Water Skiing)	Conflict. Normally considered incompatible uses in Mass.	Conflict during time lake is being used for water supply. Compatible uses at other times.	Potential conflict. Size of the pool available for boating will be decreased. Launching facilities may need modifier.	Minimal conflicts. Significant drawdown would reduce size of pool available for boating.	No significant conflicts in most cases.	No significant conflict in most cases.	Uses need to be separated for safety.	Identical use
Visual Quality	Drawdown for water supply use may impact visual quality.	Drawdown for water supply use may impact visual quality.	Drawdown may impact visual quality. Appropriate vegetative measures could lessen impact.	Drawdown may impact visual quality.	No conflict	No conflict	No conflict	

The Massachusetts Department of Environmental Management, Division of Forests and Parks owns the Ashmere Lake dam and controls the water level. The lake level is lowered in the winter to allow for flood storage in the spring. According to some local residents, the lower lake level is responsible for lower water levels in domestic water wells around the lake shore. Other residents complain that the lake is not drawn down enough to freeze nuisance weeds.

Onota Lake - The Pittsfield Conservation Commission controls the lake level. The level is maintained at a high level during the recreation season and then lowered during the winter to provide flood storage to protect downstream areas and to protect the dam from ice damage.

People seem to feel that maximum water levels are desirable for recreation. In fact, if the water level drops to 2 feet below the spillway level, access to the boat livery on the lake is severely hampered. However, many feel that the high water levels accelerate erosion potential from wave action and wake from boats. Erosion damage at the Ramsey Beach area is mentioned as an example of the erosion problems worsened by high water levels.

Timing of the drawdown of Onota Lake can create a problem if the date is delayed. Kokanee salmon spawn in the shallow areas of the lake. If the drawdown of the lake is postponed too long, spawning may occur in areas that will subsequently be drained. Late drawdown may also adversely affect amphibians that burrow.

The two deep areas of Onota Lake are separated by an old roadbed locally known as the "causeway." At high water, the causeway is under about 2 feet of water and it is exposed when the lake is drawn down. The causeway has been identified as a potential hazard to boaters that are unfamiliar with the lake and its bottom topography. Removal of the causeway construction and marking of a boat channel, or the adequate marking of the danger area have been suggested as possible solutions to the safety problem.

The causeway appears to serve some purpose in its present condition by acting as a natural barrier to confine power boats to the larger, deeper, southern portion of the lake.

Ducks and geese also use the causeway as a resting area when the lake level is down.

Plunkett Reservoir - Use of the lake by large power boats was identified as a problem. Residents felt that the lake is too small for large boats which can interfere with swimmers, fishers, sailboats, and canoes.

The reservoir level is controlled by the town of Hinsdale and is lowered after October 1. Plunkett Reservoir level management has not generated the controversy noted with the other lakes studied. Some people indicated that the lake level should be lowered until ice melt occurred to reduce erosion caused by large ice blocks being carried to shore.

Pontoosuc Lake - Lake water level is managed by the Berkshire County Engineer. The water level is maintained at a high level throughout the recreation season and is lowered in the fall to provide flood storage to protect downstream areas and also to protect the dam from the effects of ice. In recent years, the lake has been drawn down each winter as part of the weed control program initiated at the lake.

Some concerns have been expressed about the drawdown procedure and the policy for the winter drawdown. If the lake is drawn down too late in the fall, there is a potential for fish and wildlife mortality. Fish that have already spawned in shallow areas which are later drained will be subject to loss of eggs. Likewise, amphibians that may have burrowed into the mud in shallow areas which later dry out will be subject to unnecessary mortality.

The wetland areas of Secum Brook and Town Brook located upstream of Bull Hill Road in Lanesborough have been identified as potential northern pike spawning habitat. The yearly drawdown can adversely affect these areas.

Some residents of the area have complained about dust problems immediately downstream from Bull Hill Road when desiccated mudflats are disturbed by strong winds.

Richmond Pond - In 1980, Richmond Pond was drawn down to facilitate repairs. The drawdown took place in the late fall and was accomplished in several stages. As a result of the late drawdown and the sequence of the drawdown, a large number of muskrats were adversely affected. These animals were forced to build new lodges after the first drawdown and later forced to build again when the water level was dropped again. Because of the bottom topography of Richmond Pond, the drawdown concentrated the muskrats into a fairly small area and some undoubtedly left the pond area and sought new habitat at an inappropriate season. Mortality of animals that are stressed and displaced from habitat can be quite high.

Power boating and water skiing were identified as a problem by members of the public. It was noted that boaters interfere with other users of the lake and some restriction of boat operation might be necessary.

Polychlorinated Biphenyls (PCBs)

PCBs are a water quality problem in the Housatonic Basin. Their presence in the water, fish, and sediments along the Housatonic River has been documented. Several municipal landfills and possibly private dumps are thought to contain PCBs. Several groundwater aquifers are in proximity to these landfills, and are in possible danger of being contaminated. The full extent and severity of the PCB problem within the Basin is not known.

There were no investigations made concerning PCBs as part of this river basin study. The sole purpose of including PCBs in the list of problems and concerns was to acknowledge a potentially serious situation and to promote comprehensive study of the subject.

Since this study began, the PCB problem has received attention from both public agencies and private industries. The U.S. Geological Survey and the Massachusetts Division of Water Pollution Control recently published "Occurrence and Transport of Polychlorinated Biphenyl Residues (PCB) in River Water and Ground Water Adjacent to the Housatonic River, MA, October 1979 to September 1982." Geraghty and Miller Associates is conducting a study of PCBs for the General Electric Company, a former user of PCBs in the Basin.

The subject of PCBs receives no further consideration in this report.

Water Supply

The adequacy of developed sources of municipal water supply was identified as an area of concern. A water supply sufficient to meet projected needs is essential to the health, well-being, and economic future of communities.

Several potential surface water reservoir sites and high-yield groundwater aquifers provide opportunity for development of municipal sources of water.

Water supply is being addressed in detail by the U.S. Army Corps of Engineers as part of the ongoing Urban Study of the Housatonic River Basin in Massachusetts and Connecticut. Coordination was maintained with the Corps of Engineers throughout this study. The Soil Conservation Service provided the Corps of Engineers with detailed information concerning potential surface water reservoir sites in the entire Massachusetts portion of the Housatonic Basin thus eliminating duplication of effort.

In view of the Corps' study of the water supply situation in the Basin, no investigations of present developed water supplies, projected demand, or estimates of future need and recommendations to meet the need were prepared in this river basin study.

A report detailing the results of field investigations made to update the status of potential reservoir sites within the Upper Housatonic Basin is presented in Chapter 4. These potential reservoir sites may offer suitable alternatives to meet municipal needs identified and quantified in the Corps' Urban Study and other studies.

The preceding discussion of Groundwater Protection as a Problem and Concern relates directly to water supply. Recommended plan components and implementation opportunities for groundwater protection address one area of water supply interest.

Flooding and Flood Damages

Recent investigations by several agencies conclude that the potential for severe flood damage exists in the basin. Damage from a 1 percent chance flood (formerly referred to as a 100-year flood) is estimated to be over eight million dollars.

Flooding is being addressed in detail by the U.S. Army Corps of Engineers as part of an ongoing Urban Study of the Housatonic River Basin in Massachusetts and Connecticut. Coordination was maintained with the Corps of Engineers throughout this study. The Soil Conservation Service provided the Corps of Engineers with detailed flood damage information as well as hydraulic data compiled in earlier flood hazard studies of the Upper Housatonic Basin thus eliminating duplication of effort.

In light of the Corps' study of the flooding problems in the Housatonic Basin, no investigations of flooding or flood damages were conducted as part of the river basin study. Likewise, no alternatives were considered to reduce flood damage and the subject of flooding and flood damage receives only general coverage in Appendix A - Resource Base.

CHAPTER 2

RECOMMENDED PLAN

RECOMMENDED PLAN

1. Accelerate the installation of conservation practices on cropland in the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond to reduce erosion rates, and thus reduce nutrients delivered to the lakes.

2. Institute agricultural waste management systems (plans) on farms throughout the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond to reduce the amount of nutrients from animal waste delivered to the lakes.

3. Establish public control on three important wetland areas to protect the natural resource value of the areas and to permit public enjoyment of the wetlands.

4. Implement a program to protect the water quality in the Town Brook aquifer.

5. Establish Lake Management Advisory Groups for Ashmere Lake, Onota Lake, Pontoosuc Lake, Plunkett Reservoir, and Richmond Pond to enable competing lake interests to communicate and develop acceptable lake management strategies.

Formulation of this "Recommended Plan" was based on suggestions received from local, state, and federal agencies in response to circulated review drafts, and from comments and ideas received at a series of public meetings held in the watersheds of the five major lakes.

The Plan contains elements selected to meet identified needs within the specific water resource problems and concerns of the Basin. The Plan elements comprise a series of recommendations that appear to be both politically and environmentally acceptable, as well as being implementable.

Problem or Concern: Eutrophication of Lakes

Recommended Plan Element: Accelerate the installation of conservation practices on cropland in the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond to reduce erosion rates, and thus reduce nutrients delivered to the lakes.

Discussion: Erosion from tilled cropland in the watersheds of Onota and Pontoosuc Lakes and Richmond Pond contributes significant percentage of the sediment and total phosphorus delivered to the lakes.

Most of the tilled cropland in these three watersheds is used for the production of silage corn for animal feed. Location of this cropland is indicated on Figures 2-1 through 2-3.

Erosion from the cropland is aggravated by a number of factors including the plowing of the soil that eliminates vegetative cover and makes the field more vulnerable to the erosive effects of falling rain and surface runoff. In addition, due to the topography of Berkshire County, many of the fields have steep slopes which increase the velocity of runoff and result in increased erosion. Finally, since silage corn is harvested late in the year, many farmers do not plant cover crops to protect the soil from fall and spring winds and high volumes of runoff from melting snow.

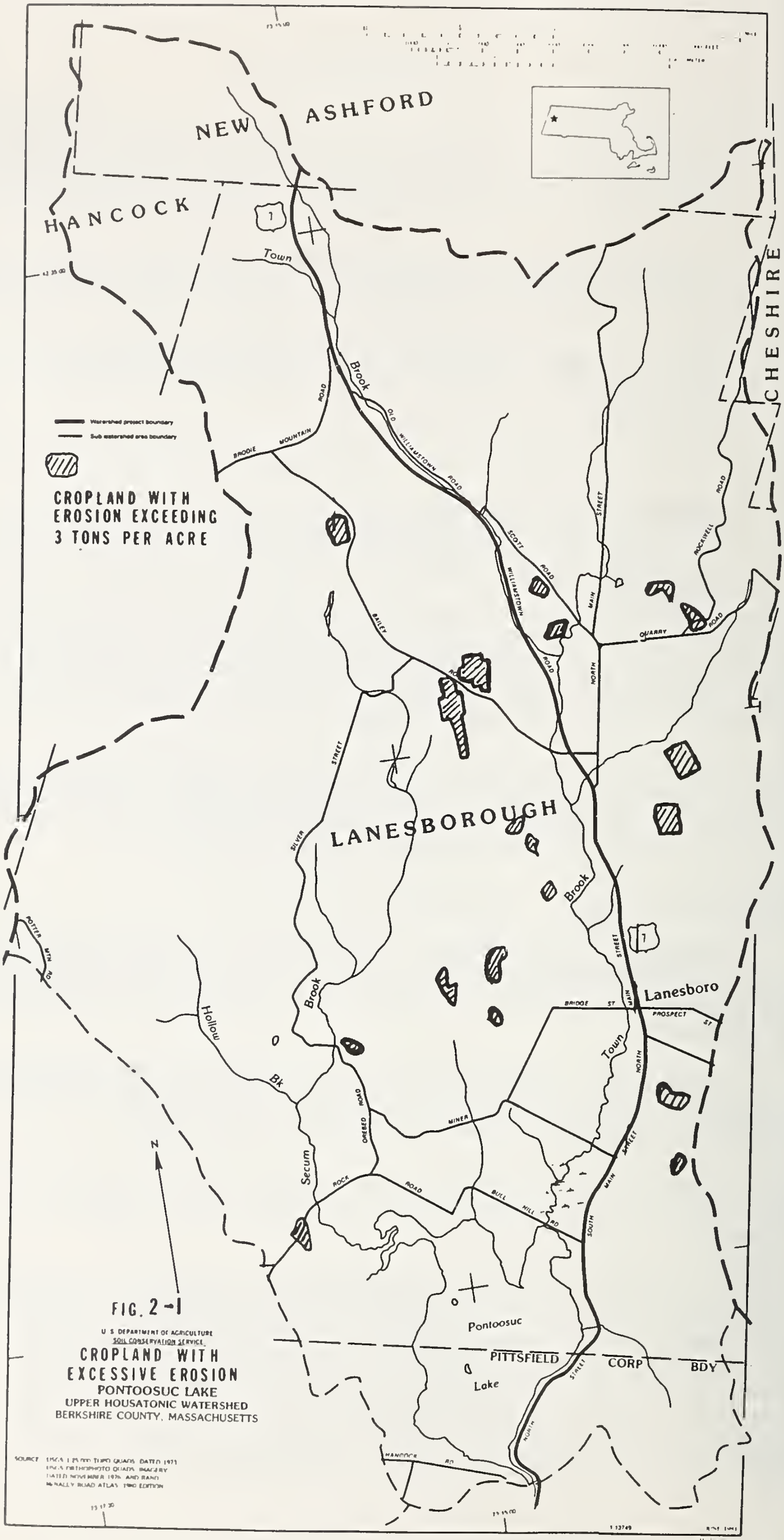


FIG. 2-1

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CROPLAND WITH EXCESSIVE EROSION
PONTOOSUC LAKE
UPPER HOUSATONIC WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

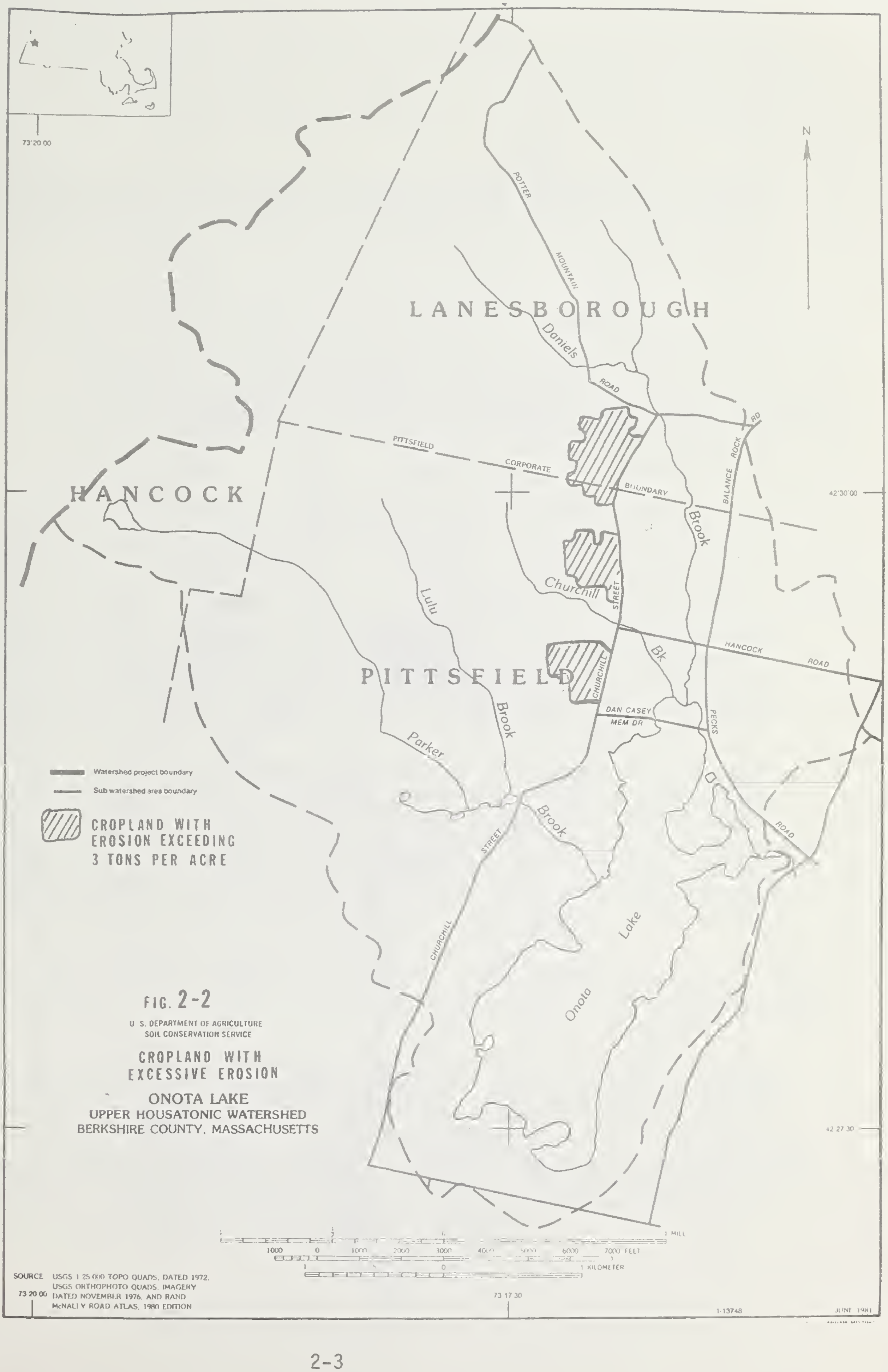


FIG. 2-2

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CROPLAND WITH EXCESSIVE EROSION

ONOTA LAKE
UPPER HOUSATONIC WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

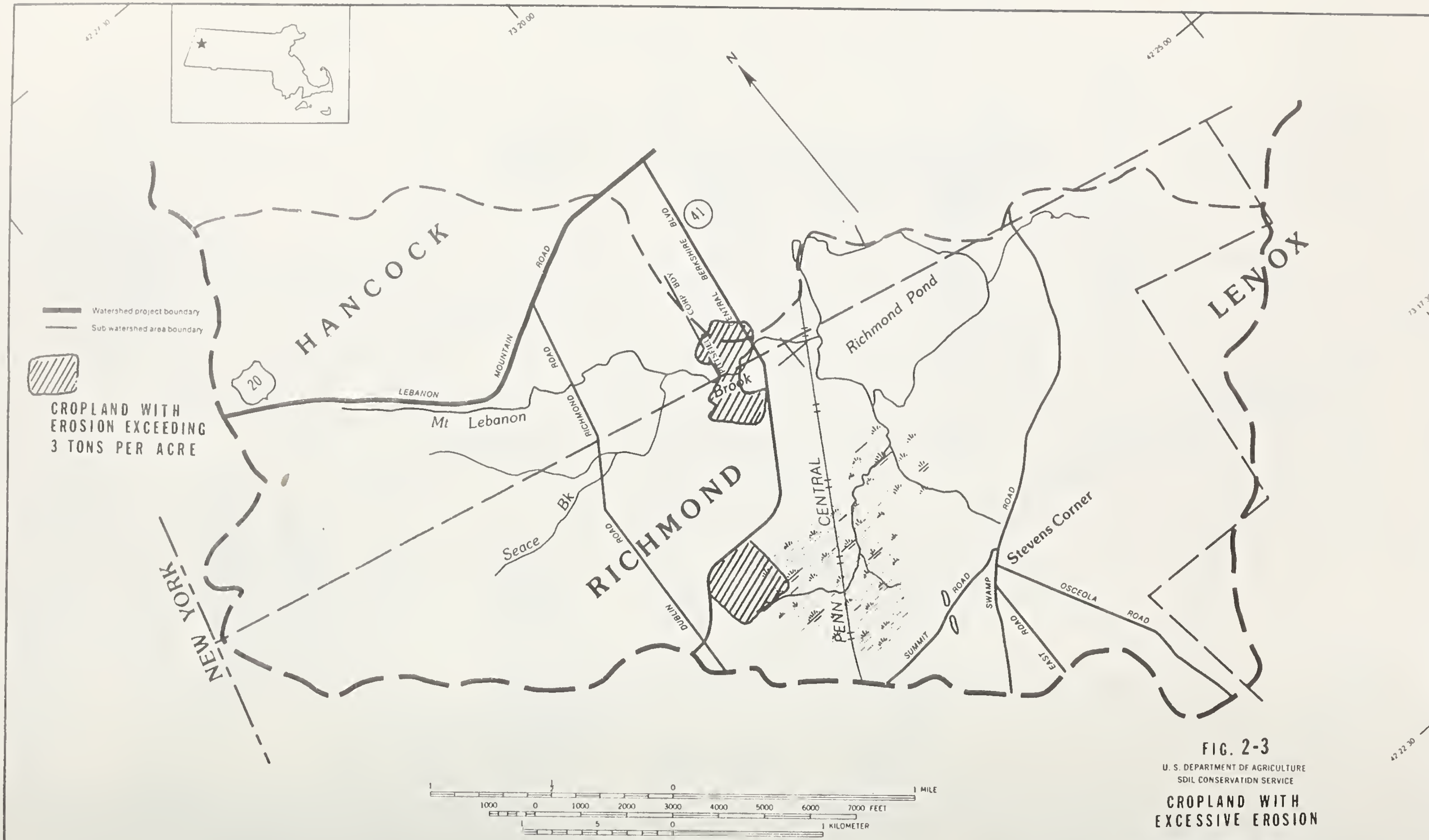


FIG. 2-3
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
CROPLAND WITH
EXCESSIVE EROSION

RICHMOND POND
UPPER HOUSATONIC WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

SOURCE USGS 1:25,000 TOPO QUADS DATED 1973
USGS ORTHOPHOTO QUADS IMAGERY
DATED NOVEMBER 1976 AND RAND
McNALLY ROAD ATLAS 1980 EDITION

For a large number of soils found in Berkshire County, it has been determined that soil productivity can be maintained indefinitely if soil erosion losses are kept below 3 tons per acre. In effect, the 3 tons per acre becomes a loss that can be tolerated and normally represents an economic limit below which additional reduction may not be cost effective. The 3 ton per acre limit is often referred to as a tolerable rate or "T".

Erosion data for tilled cropland in the three lake watersheds were examined to determine those areas where erosion was greater than 3 tons per acre. Results of this analysis are presented in Table 2-1.

Table 2-1

Tilled Cropland With Erosion Rates Over 3 Tons Per Acre

Lake	Sedimentation from Tilled Cropland (tons/year)	Sediment from Tilled Cropland with Erosion Rates over 3 tons/acre (tons/year)	Fields with Erosion Rates over 3 tons/acre (number)
Onota Lake	186	167	3
Pontoosuc Lake	688	302	14
Richmond Pond	113	50	3

Soil Conservation Service technicians visited each field that had an erosion rate greater than "T" and selected conservation practices for analysis that could be used to reduce the erosion rate down to the "T" value. Among the practices considered were contour planting of corn, cover crops, and conversion of cropland to permanent hayland.

Contour farming or across-the-slope farming means farming across the field slope in gracefully curving, level rows. Each row is laid out on the level, or nearly so, depending on the individual field conditions. Contour rows form ridges which act like small dams holding back the flow of water and giving it a chance to soak into the soil. Up and down hill rows let water run off quickly carrying topsoil and fertilizer with it. Across-the-slope farming is well suited to gently sloping fields. If fields are long or steep, stripcropping, terraces, or diversions are used with the contouring.

Strip cropping is growing cultivated crops and close-growing crops such as grain or hay, in alternate bands across the slope of the land. Surface runoff and erosion is reduced.

Cover cropping is growing vegetation for temporary soil protection. The kind of cover crop and planting date varies with the primary crop being grown and the time soil protection is needed. Cover crops protect the soil by holding topsoil in place and are usually planted immediately after cultivated crops are harvested. Winter rye or winter wheat are typical cover crops. They should be seeded before September 15 which may be a problem in Berkshire County silage corn operations. Newly developed cold region crops such as Aroostook rye, developed for use in northern Maine, appear promising.

Some extremely steep fields should not be used for the production of cultivated crops. Erosion is so severe on these steep slopes that soil losses will soon result in total loss of topsoil and drastic decreases in productivity. Increasing inputs of chemical fertilizers will be required to maintain productivity. When topsoil is eroded, the subsoil then becomes susceptible to increased erosion due to its poor ability to support vegetative cover.

For those extremely steep slopes, conversion from cultivated crops to permanent cover such as hay or pasture is recommended.

In determining an acceptable means of reducing soil loss to a tolerable level, the SCS technicians first considered the effect of applying a cover crop to the tilled cropland after the corn was harvested. If cover cropping did not sufficiently reduce erosion, a cover crop coupled with contour cropping or stripcropping was considered. If erosion rates were still exceeding 3 tons per acre, permanent conversion to hay or pasture was evaluated. The effects of various measures and combinations are illustrated in Table 2-2.

Table 2-2

Effect of Conservation Practices Applied to Reduce Cropland Erosion

Lake Watershed	Present Conditions		Cover Cropping		Cover Cropping with Contour Farming		Cover Cropping with Contour Farming or Conversion to Permanent Past	
	Fields with Excess. Erosion	Sediment Delivered to Lake (tons)	Fields with Remain. Excess. Erosion	Sediment Delivered to Lake (tons)	Fields with Remain. Excess. Erosion	Sediment Delivered to Lake (tons)	Fields with Remain. Excess. Erosion	Sedime Delive to Lak (tons)
Onota Lake	3	167	2	111	0	74		*
Pontoosuc Lake	14	302	9	205	7	164	0	51
Richmond Pond	3	50	0	32		*		*

*Not evaluated since preceding practices reduced erosion rate below 3 tons per acre.

Erosion, even below the tolerable limit to maintain soil productivity will still result in a sediment load being delivered to the stream. Sediment delivery can be reduced by some relatively low cost measures such as maintenance of filter strips or untilled areas between cultivated fields and watercourses. These filter strips with vegetation act as areas where sediment will be deposited before reaching the stream.

Problem or Concern: Eutrophication of Lakes

Recommended Plan Element: Institute agricultural waste management systems (plans) on farms throughout the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond to reduce the amounts of nutrients from animal waste delivered to the lakes.

Discussion: Farm animal manure is a valuable agricultural resource. Farmers have tried to make maximum use of the fertilizing and soil-conditioning values of manure. Poor management of manure, however causes potential environmental problems and subjects the farmer to trouble with his neighbors and regulatory authorities.

Typical examples of poor agricultural waste management include allowing cows to have free access to streams, or locating a barnyard or cattle holding area on the banks of a stream. Another poor practice is the spreading of manure on frozen fields where melting snow can carry the nutrients to the closest brook.

Good agricultural waste control involves three principles:

1. Keep clean water from becoming polluted.
2. Collect and store wastes until they can be disposed of in a non-polluting manner.
3. Put wastes back on the land at application rates that the soil can safely assimilate.

Manure should not be spread within 25 feet of the high water line for watercourses. Manure can be spread on flood plain soils if the manure is worked into the soil and the area revegetated before the ground freezes.

No manure should be spread on frozen or snow covered ground except on upland soils of no more than 3 percent slope, and then not closer than 100 feet from wells, springs, ponds, lakes, or streams.

Cattle and other farm animals on pasture or in yards should not be given free access to streams. Watering troughs or livestock ponds should be provided.

Drainageways should not run through exercise yards. The animals should be fenced out or the drainage rerouted. Roof runoff from barns should be diverted so that it doesn't run through areas where animals are concentrated.

Runoff water should also be diverted around manure storage areas. If manure is stored in a field prior to spreading, the field should be flat or have a gentle slope with little or no drainage area that would contribute runoff through the storage site. The storage area should be at least 300 feet from any known high water and at least 300 feet away from any springs or wells. To avoid harmful concentrations of nutrients, manure should not be left piled on the land for more than 1 year and the same site should not be used for stockpiling 2 years in a row.

Spreading manure on the land is the most common method of disposal. It is probably the lowest cost technique when sufficient land area is available for spreading. Soil is an effective sewage treatment medium. Biologic and chemical processes in the soil remove nitrogen, phosphorus, ammonia, bacteria and decrease biochemical oxygen demand. Lighter-textured soils (sandy loam)

have better air and moisture movement and distribution, and decompose organic matter faster than heavy-textured soils (silt loam, clay loam). Heavy-textured soils, however, can retain more plant nutrients in the upper soil profile.

Heavy-textured soils have slow water infiltration rates and liquid waste applications must be limited to avoid runoff. Coarse-textured soils usually have high permeabilities and can take high liquid applications without runoff, but some potential pollutants may be leached right through these soils. For these soils, manure should be applied throughout the growing season to reduce leaching.

Some farmers have a limited amount of land to spread manure on, and need to make as heavy an application as the soil can take. The soil has a high capacity for absorbing agricultural wastes but too much can damage crop yields and cause pollution hazards. Nitrogen, because of its pollution potential, is the usual factor considered in limiting the amount of manure that can be applied safely to the land.

It is commonly accepted that 1 ton of dairy manure is about equal to 100 pounds of 10-5-10 commercial fertilizer. When losses through storage, winter spreading, etc. are considered, 1 ton is probably equivalent to 100 pounds of 5-3-6 fertilizer.

Recommendations for maximum application rates vary, but for repeated year-after-year applications, 300 pounds of nitrogen per acre annually seems appropriate (30-60 tons of manure per acre). Higher rates of up to 500 pounds of nitrogen (50 to 100 tons of manure) per acre per year plus the amount removed by the crop are contained in guidelines developed for farms in Maine; but applications are made at these rates only to get rid of manure and may damage the crop.

Problem or Concern: Protection of Wetlands

Recommended Plan Element: Establish public or quasi-public control of three important wetland areas to protect the natural resource value of the areas and to permit public enjoyment of the wetlands.

Discussion: The wetlands in the Upper Housatonic River Basin are significant for a variety of reasons. Appendix B of this report indicates the extent of the Basin wetland resource and evaluations of the individual wetland areas for various purposes.

The significance of many of these wetlands has been recognized and public agencies and private groups have acquired title to many of the more important wetland areas. Public control of these wetlands assures that they will be protected from private development and will be available for public use and enjoyment.

This study identified three wetland areas that are presently in private ownership that merit consideration for public or quasi-public acquisition. The Massachusetts Wetlands Protection Act, strengthened by recently implemented regulations, will provide a high degree of protection against development of the privately owned wetlands in the Basin. However, to ensure a higher degree of protection for these special areas, and to enhance their availability for public enjoyment, it is recommended that the following wetland areas be acquired by public agencies:

Town Brook wetlands in Lanesborough (Wetlands System L8 and 9)

Center Pond wetlands in Dalton

Quaking Bog in Hinsdale (Wetland System 19)

The Town Brook wetlands in Lanesborough are perhaps the most critical remaining private wetlands in the Basin. Lanesborough's well fields are located within wetland system L8, and the wetlands cover much of the primary recharge area for the aquifer. The wetlands also provide natural valley flood storage and contain excellent wildlife habitat.

Center Pond and its associated wetland system have excellent potential as a water-based recreation facility as well as contributing a great deal to the visual character of the town of Dalton. This wetland system also has value for flood control and wildlife habitat.

Quaking Bog in Hinsdale (Wetland System 19) is geologically and botanically unique. Acquisition and conservation of the area by an environmentally-sensitive organization will insure that its special qualities are protected.

Problem or Concern: Groundwater Protection

Recommended Plan Element: Implement a program to protect the water quality in the Town Brook aquifer.

Discussion: In the entire Upper Housatonic River Basin, only one aquifer serves as a municipal water supply, Town Brook in Lanesborough. The town relies solely upon two wells in this aquifer for water. Because of this dependence on groundwater, protection of Town Brook aquifer is recommended.

Lanesborough presently is pumping an average of 0.2 million gallons per day (mgd) from the Town Brook aquifer. The safe yield of the wells is estimated at 2.0 mgd. Lanesborough's needs for water for the foreseeable future can be met with adequate protection of water quality in this aquifer.

The "208" Water Quality Management Plan for the Upper Housatonic River listed the major threats to the Town Brook aquifer as road salting and urbanization. The proposed relocation of Route 7 has the potential to impose additional salt hazards for Lanesborough's #2 well.

Components of a program to protect the water quality in the Town Brook aquifer could logically include the following measures:

1. Pump test the two existing wells to define 7-day, dry weather drawdown cones of depression.

2. Implement a groundwater protection bylaw.

3. Designate portions of highways as restricted salt zones.

A cone of depression is produced in the water table by withdrawal of water from an aquifer. In cross section, the cone is shaped like an inverted triangle with it's apex at the pumping well. The pump test is done during dry weather for 7 continuous days to define the horizontal extent of the portion of the

aquifer where pollution will quickly appear in the water being pumped. The area described by the 7-day pumping test needs to be zealously protected from human habitation and any activities likely to result in threats to groundwater quality.

Many communities in Massachusetts have implemented aquifer protection zones as overlay districts in the local zoning bylaw. The intent of a groundwater protection bylaw is to protect the quality of water in the aquifer by regulating land use in the area that recharges the aquifer.

Most groundwater protection bylaws include definitions of technical terms used to describe aquifers, groundwater geology, and the movement and recharge of subsurface water.

Aquifer Protection Zones can be included within the bylaw to define, in order of protection needs: the 7-day pumping cone of influence, and the primary, secondary, and tertiary recharge areas.

Within the 7-day cone of depression, only passive uses of land are permitted such as nature study, fishing, and non-intensive agriculture. This zone receives the highest degree of protection since pollution hazards within the zone have the potential for quickly affecting the quality of water being pumped into the municipal system.

The primary recharge area protection zone includes the area immediately overlaying the aquifer and adjacent areas from which groundwater flows directly into the aquifer. Residential development in the primary protection zone is permissable, but minimum lot sizes of at least 1 acre are recommended. Not more than 10 percent of the area can be covered with impervious material such as buildings, streets, driveways, etc. Some communities have elected to require even larger minimum lot sizes than 1 acre.

The secondary recharge area protection zone is usually the land area adjacent to the primary recharge area from which groundwater moves down-gradient into the aquifer. Residential use is normally permitted and minimum lot size may be smaller than that specified for the primary recharge zone.

Prohibited uses in the primary and secondary recharge areas normally include:

- disposal of solid waste
- commercial storage of petroleum products
- disposal of other than residential liquid waste
- use of toxic organic chemicals
- storage of road salt
- animal feedlots and manure storage
- gravel extraction
- storage of hazardous waste
- junk yards

Industrial and commercial activities are usually allowed by special permit with restrictions upon the disposal of waste water, the percent of impervious area developed, and the increase in surface runoff. Intensive agricultural use requires a special permit if continuing applications of fertilizer, pesticides, or herbicides are made.

The tertiary recharge area is the upstream drainage areas of streams that traverse the primary recharge area. Water that falls in the tertiary area moves first into the surface water system and then, by induced infiltration from the stream into the aquifer. Land use regulation in the tertiary zone is less restrictive than in the primary and secondary zones. Control is targeted to those obvious water pollution threats such as land fills, industrial discharges, and large scale developments. Some communities do not attempt to delineate or regulate land use within the tertiary recharge area under the groundwater protection bylaw.

Quite commonly in delineating the various recharge areas, the geology of a sand and gravel aquifer is interpreted from standard U.S. Geological Survey Surficial Geology Maps, Groundwater Favorability Studies, and limited drilling. Figure 2-4 indicates the protection zones recommended for Town Brook in Lanesborough.

It is anticipated that a 7-day pumping test of the two Town Brook wells would indicate that road drainage from Bridge Street and Miner Road may infiltrate to the aquifer within the 7-day cone of influence. This situation has the potential to contribute to the increased sodium levels from road salting activities.

It is, therefore, recommended that sections of Bridge Street and Miner Road that drain into the 7-day cone of influence area be designated as "no-salt" zones and that increased snow plowing frequency and road sanding be substituted for salting to assure safe highway conditions.

Additionally, it is recommended that those sections of highway that drain into the primary aquifer recharge area indicated on Figure 2-5 be designated as "limited-salt" zones. In these zones, the application of roadway de-icing salt should be limited to the absolute minimum required to maintain highway safety.

Problem or Concern: Multiple Use of Lakes

Recommended Plan Element: Establish Lake Management Advisory Groups for Ashmere Lake, Onota Lake, Pontoosuc Lake, Plunkett Reservoir, and Richmond Pond to enable competing lake interests to communicate and develop acceptable lake management strategies.

Discussion: These five lakes are utilized for a variety of purposes and reasons by diverse groups of people. These uses often conflict and can result in less than optimum use of the resource.

Among the more common conflicts are those involving water level management, especially winter drawdown for flood control, aquatic weed management, or dam safety. Another common concern has been use of the smaller lakes by boaters with large motors.

In addition to these common conflicts, each lake has an individual set of problems or opportunities that deserve discussion, communication among interest groups, and resolution of the problem or development of the opportunities.

It is recommended that Lake Management Advisory Groups be established for each of the five major multiple use lakes in the Basin. These Groups, comprised of representatives from each special interest group would meet to discuss lake issues and attempt to arrive at a consensus concerning use of the lakes.

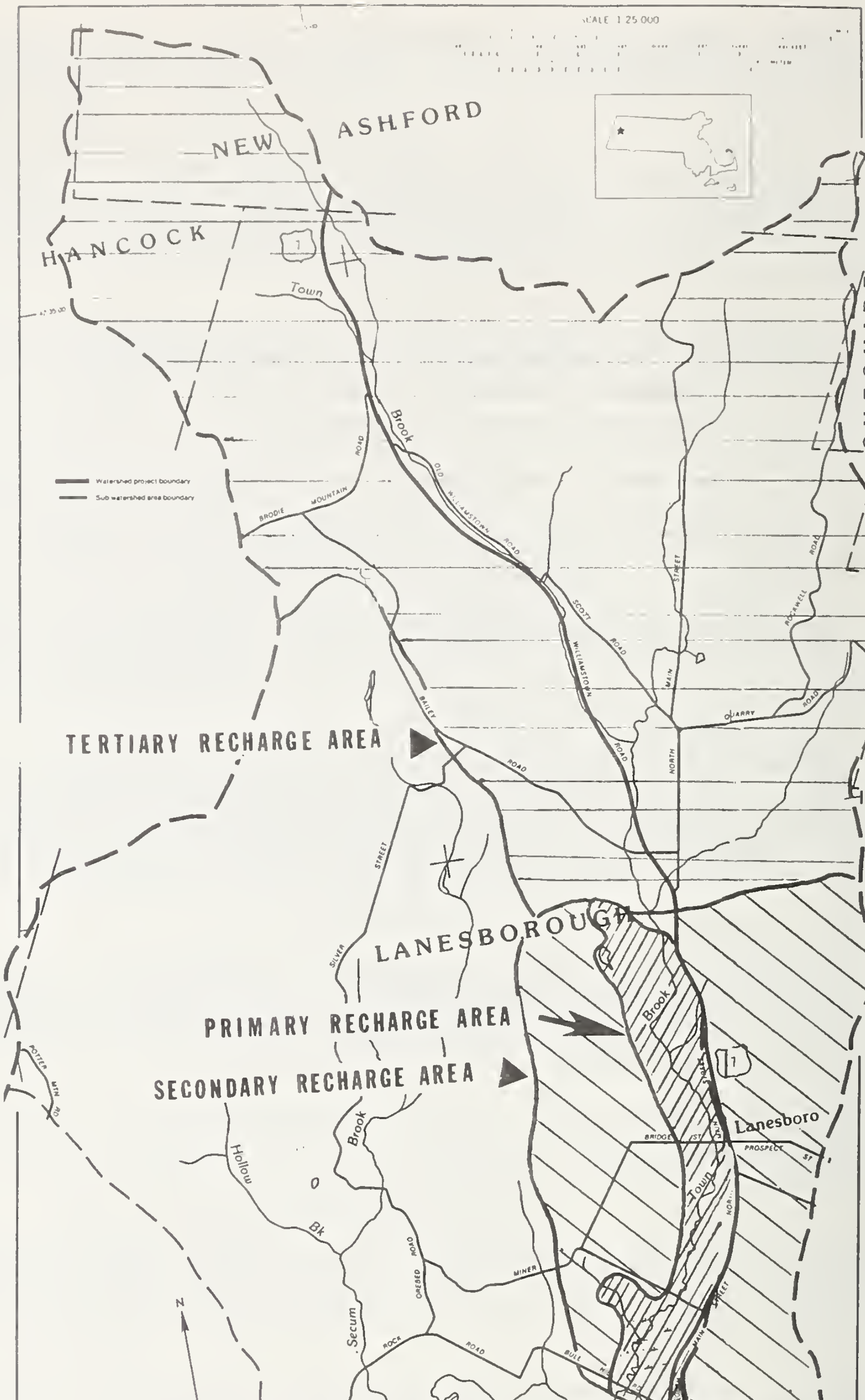


FIG. 2-4

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TOWN BROOK AQUIFER

UPPER HOUSATONIC WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

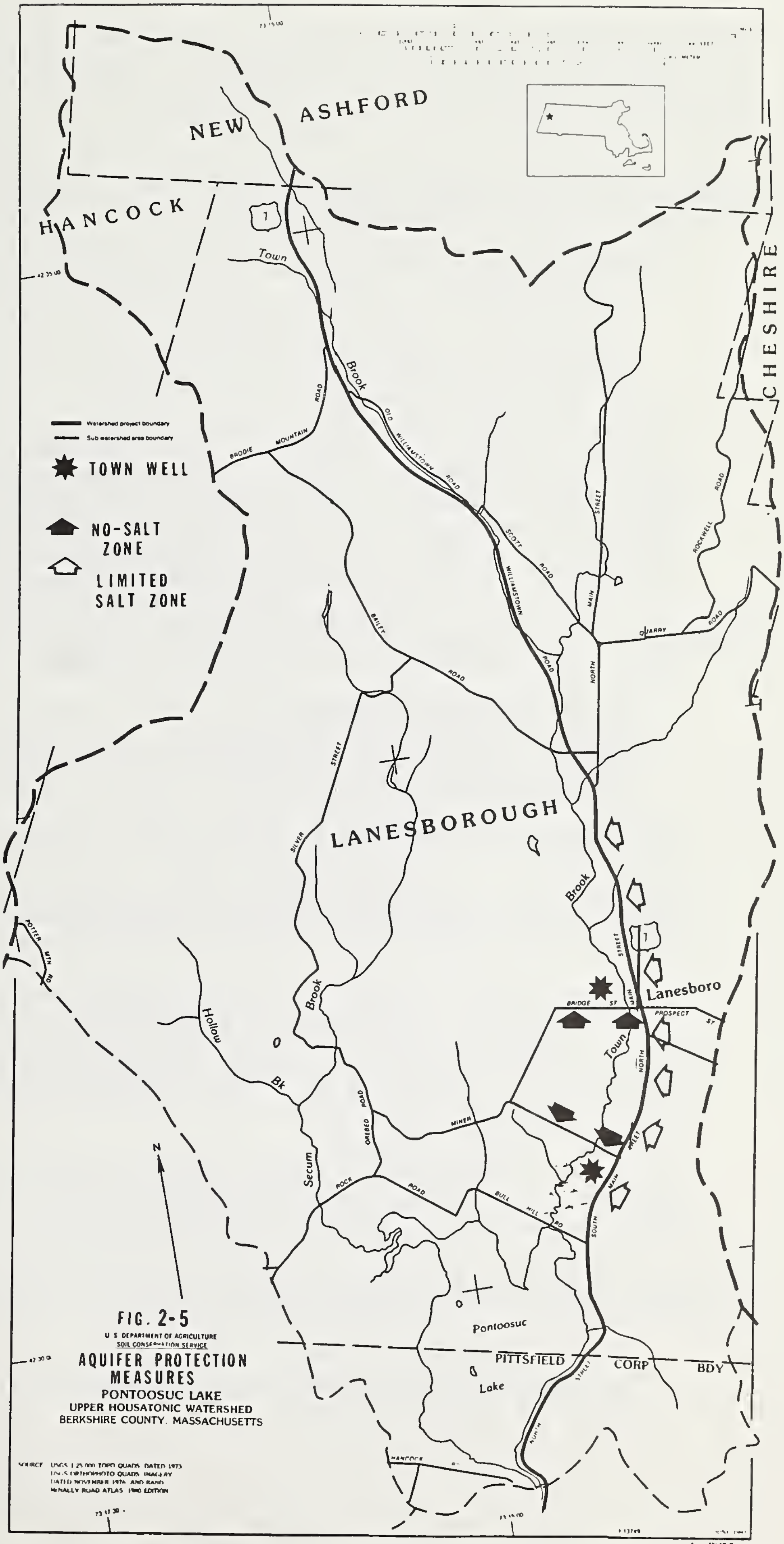


FIG. 2-5

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

AQUIFER PROTECTION MEASURES

PONTOOSUC LAKE
UPPER HOUSATONIC WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

SOURCE: USGS 1:25,000 TOPO QUADS DATED 1973; USGS ORTHOPHOTO QUADS IMAGERY DATED NOVEMBER 1976; AND RAND McNALLY ROAD ATLAS 1980 EDITION

Since the interest groups and their concerns differ from lake-to-lake, the following minimum composition is suggested for each Lake Management Group. In addition, some of the specific lake issues and opportunities are presented with the hope that the Lake Management Advisory Groups can use the issues as a beginning point to develop a cooperative management strategy.

Ashmere Lake - The minimum membership on the Lake Management Advisory Group should include a representative from:

Massachusetts Department of Environmental Management (owner of the dam)
Hinsdale Conservation Commission
Massachusetts Division of Fisheries and Wildlife
Ashmere Heights Association

Use of the lake by water skiers and large power boats was identified as a potential conflict. In addition, winter drawdown was mentioned at public meetings as a subject of concern. The drawdown has been blamed for lower water levels in domestic wells, while other residents complain that the lake should be drawn down more to freeze aquatic weeds. Public recreational access to the lake is limited. It has been suggested that more recreational use could be available with improved public access.

Onota Lake - The minimum membership on the Lake Management Advisory Group for Onota Lake should include a representative from:

Pittsfield Water Department
Pittsfield Conservation Commission
Massachusetts Division of Fisheries and Wildlife
Recreational users of the lake

Winter drawdown of the lake for flood control storage and dam safety is an important part of the management plan. However, recreational users have indicated that drawdown limits access to the lake marina. Timing of the drawdown can create a problem if the drawdown is delayed beyond the date that Kokanee salmon spawn in shallow areas of the lake.

The two deep areas of Onota Lake are separated by an old roadbed known as the "causeway." The causeway has been identified as a potential hazard to boaters that are unfamiliar with the lake. Other people have indicated that the causeway serves as a resting area for ducks and geese during low water and also serves to confine large boats to the southern portion of the lake.

A fish screen installed at Lakeway Drive to prevent the escape of catchable fish has been damaged by vandals and ice. Thousands of fish have left the lake through the damaged screen.

Plunkett Reservoir - The minimum membership on the Lake Management Advisory Group should include a representative from:

Hinsdale Conservation Commission
Massachusetts Division of Fisheries and Wildlife
Lake shore property owners

The use of the lake by larger power boats was identified as a problem by members of the public. Among suggestions presented were to limit boat horsepower, standardize the direction of operation, and limit hours of operation.

Public access to the pond is quite limited. An area along Plunkett Road provides some access, but shoreline residents complain about people crossing private property to reach the water, others have expressed concern that increased public access would worsen the conflict between large power boats and other lake users. Lack of adequate public access also limits the level of fish stocking provided by the Massachusetts Division of Fisheries and Wildlife.

The beach area near Plunkett Road has been identified as a potential safety hazard since recreational activities sometimes spill over onto the road.

Pontoosuc Lake - The minimum membership on the Lake Management Advisory Group should include a representative from:

Berkshire County Commissioners
Pittsfield Conservation Commission
Lanesborough Conservation Commission
Massachusetts Division of Fisheries and Wildlife
Cottage owners around the lake

Winter drawdown for flood control and dam safety is an important part of the lake management plan. In recent years, the winter drawdown has been an integral part of the aquatic weed control program. Fish and wildlife interests have expressed concerns about possible adverse effects on fish spawning in the lake, and on fish and wildlife habitat both in the lake and downstream, as well as in the upstream adjacent wetlands.

Richmond Pond - The minimum membership on the Lake Management Advisory Group should include a representative from:

Lakeside Christian Camp (owners of the dam)
Richmond Conservation Commission
Pittsfield Conservation Commission
Massachusetts Division of Fisheries and Wildlife
Richmond Shores Civic Association

In 1980, Richmond Pond was drawn down to facilitate repairs. The drawdown took place in the late fall and was accomplished in several stages. As a result of the late drawdown and sequence of the drawdown, a large number of muskrats were adversely affected. The adverse effects of the drawdown might have been reduced if the operation had been coordinated with Massachusetts Division of Fisheries and Wildlife personnel who could have offered suggestions regarding drawdown timing and possible effects.

[illegible] and water [illegible] at Richmond Pond were identified as [illegible] members of the [illegible]. It was noted that boaters inter- [illegible] other users of the lake and some restriction of boat oper- [illegible] e desirable.

[illegible] 2-1 presents a display of the effects of each plan element on four [illegible]: national economic development, environmental quality, regional [illegible]ic development, and other social effects.

Display of Plan Element Effects

Element	National Economic Development	Environmental Quality	Regional Economic Development	Other Social Effects
1. Install practices on cropland in the watersheds of Onota Lake, Pontoosuc Lake and Richmond Pond to reduce erosion rates and thus reduce nutrients delivered to the lakes.	Beneficial Effects Increased quality of water-based recreation will be available to users of the three lakes. Adverse Effects Cost to install and maintain practices; $21,000 per year.	Beneficial or Adverse Effects Reduction of phosphorus and nitrogen delivered to the lake will complement other measures to improve the trophic status of the three lakes. Reduction of 246 kg of phosphorus per year.	Beneficial Effects Increased quality of water-based recreation will be available to users of the three lakes.	Beneficial or Adverse Effects Farm operators will be taking positive steps toward conserving the soil resource.
2. Institute agricultural waste management practices on farms in the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond to reduce the amount of nutrients from animal waste delivered to the lake.	Beneficial Effects Increased quality of water-based recreation will be available to users of the three lakes. Adverse Effects Nil-Recommended measures are low cost-no cost alternatives to present practices.	Reduction of animal waste and nutrients reaching watercourses and lakes.	Beneficial Effects Increased quality of water-based recreation will be available to users of the three lakes. Farmers will obtain a greater percentage of the economic value of the nutrients in manure.	Aesthetic problems with manure disposal will be minimized.
3. Establish public control on four important wetland areas to protect the natural resource value of the areas and to permit public enjoyment of wetlands.	Beneficial Effects Wetland areas will be available for public recreational use.	Wetlands will be positively protected from adverse development.	Beneficial Effects Wetland areas will be available for public recreational use. Adverse Effects Cost of wetland control, management; and reduction of tax base.	Public satisfaction that wetlands will be protected. Increased public awareness of wetland values.
4. Implement a program to protect the water quality in the Town Brook aquifer.	Beneficial Effects Municipal water resource will be protected.	Water quality will be protected.	Beneficial Effects Municipal water resource will be protected and be available to meet the needs of Lanesborough for the foreseeable future. Adverse Effects Cost of drafting, implementing and enforcing measures. Development in aquifer area will be curtailed.	Limiting use of salt may adversely affect highway safety.
5. Establish Lake Management Groups for Ashmere Lake, Onota Lake, Pontoosuc Lake, Plunkett Reservoir, and Richmond Pond to enable competing lake interests to communicate and develop acceptable lake management studies.	Beneficial Effects Recreational opportunities will be available with fewer conflicts between users. Adverse Effects Negligible administrative costs.		Beneficial Effects Recreational opportunities will be available with fewer conflicts between users.	Increased communication between groups with common resource concerns. Increased public awareness of the multi-purpose use of the lakes.

Comparison of Plan Elements and Needs

As indicated in the 208 study and summarized in Table 1-1 of this report, phosphorus from runoff-related sources is a major source of the phosphorus supplied annually to the five major lakes of the Basin. This river basin study estimates that erosion-related phosphorus accounts for the following percentage of the total phosphorus input to the lakes as indicated in Table 2-4.

Table 2-4

Effect of Conservation Practices to Reduce Erosion on Tilled Cropland

	Present Conditions		With Conservation Practices to Reduce Erosion on Cropland to 3 Tons Per Acre			
Lake	Total Phosphorus (kg)	Phosphorus from Erosion-Related Sources (kg)	Phosphorus from Erosion-Related Sources (kg) 1/	Total Phosphorus (kg)	Reduction Total Phosphorus (kg)	Percent Reduction in Total Phosphorus
Onota	851	216	152	787	64	8
Pontoosuc	2283	659	489	2113	170	7
Richmond	851	145	133	839	12	1

1/ Assumes maximum utilization of practices displayed in Table 2-2 and a phosphorus delivery rate from tilled cropland of 0.68 kg of phosphorus per ton of sediment.

The phosphorus reductions indicated in Table 2-4 are not high enough to significantly change the trophic state prediction for any of the lakes. However, when viewed in the context of the overall 208 Recommended Lake Management Plan, the inclusion of measures to reduce phosphorus contribution from agricultural land can make a significant contribution to the Plan. For example, the 64 kg reduction achievable from erosion control measures in the Onota Lake watershed and the 12 kg reduction at Richmond Pond are roughly equivalent to the reduction expected from a leaf collection and removal strategy recommended in the 208 study. For Pontoosuc Lake, the 170 kg reduction from erosion control measures is about one-half the phosphorus removal expected from in-lake weed harvesting.

Conservation practices are estimated to cost $21,000 per year to install and maintain. A total of 246 kg of phosphorus are expected to be prevented from reaching the lakes, yielding a cost/effect ratio of about $85 per kilogram of phosphorus. The 208 areawide summary (Table B-2) with updated costs indicates a cost range of from $17 per kilogram reduction for the use of non-phosphorus

detergent to $231 per kilogram for a leaf control program. Conservation practices for phosphorus reduction with a cost of $85 per kilogram appear reasonable from a cost effectiveness standpoint.

Agricultural waste management practices could be expected to reduce phosphorus contribution as indicated in Table 2-5 utilizing estimated reductions from the 208 study.

Table 2-5

Reduction in Phosphorus Expected with Better Manure Handling Practices

Lake	Phosphorus Reduction (kg)	Percent Reduction in Total Phosphorus Delivered to Lake
Onota	35	4
Pontoosuc	50	2
Richmond	42	5

Again, the phosphorus reductions from improved manure management practices will not be enough to significantly alter the trophic state prediction for any of the lakes. However, better manure management will complement the 208 Recommended Plan, conserve manure nutrient resources, and not add significantly to the costs incurred for farmers.

The four important wetland areas that have been recommended for public acquisition will increase the resource base available for public enjoyment of the wildlife and aesthetic values of these areas.

Protection of the Town Brook aquifer from contamination will insure that this water will be available to meet the needs of the town of Lanesborough. The aquifer is estimated to be able to supply about 2 million gallons of water per day (mgd). Since current Lanesborough average daily use is about 0.2 mgd and projections indicate that Lanesborough's population will increase less than 20 percent by the year 2000, the Town Brook aquifer should be able to meet local needs well into the 21st century if water quality can be maintained.

Several significant local issues have been identified involving multiple-purpose use of the five major lakes. Establishment of Lake Management Groups for each lake will enable competing interests to get together, communicate, and reach acceptable compromises to maximize potential use.

Environmental Effects of Plan Elements

Table 2-3 displays the effects of Plan elements on environmental quality. Plan elements were specifically selected to protect and enhance the natural resource base of the Upper Housatonic River Basin. Environmental effects could be characterized as being overwhelmingly beneficial.

The environmental impact of the Recommended Plan within the Basin is summarized in Table 2-3. Environmental impact outside the Basin is expected to be minimal.

The Plan elements coordinate with or complement existing land use plans, policies, and controls for the Basin. Element four recommends the strengthening of the Lanesborough zoning bylaw to ensure protection of the groundwater resource. Elements 1, 2 and 4 complement the recommendations of the "208" Water Quality Management Plan for the Upper Housatonic River. No new state or federal legislation or programs will be required to implement the Plan elements.

Chapter 4 details several alternative elements studied during the evaluation and analysis phase of this study. These alternative elements were among those suggested during public meetings and those that appeared feasible based on preliminary evaluation of data. Implementation of the Plan elements is expected to have long-term beneficial effects on the environment.

CHAPTER 3

OPPORTUNITIES FOR IMPLEMENTATION

CHAPTER 3

OPPORTUNITIES FOR IMPLEMENTATION

This chapter identifies agencies, groups, and organizations that could take leadership to implement portions of the Recommended Plan. Further discussions include various federal, state, and local programs that are of concern in this study. Some of the Recommended Plan elements can be implemented through various programs; the opportunities outlined in this chapter present some, not all, possibilities for implementation.

Plan Element: Install practices on cropland in the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond to reduce erosion rates, and thus reduce nutrients delivered to the lakes.

Opportunities for Implementation: The majority of the tilled cropland in the Upper Housatonic Basin is privately owned. Individual farmers and landowners make independent decisions as to the use of farmland and methods used in farming enterprises. The nature of farming with its varied weather uncertainties and crop economic conditions seems to favor a diverse mix of management styles and practices.

Unfortunately, these independent choices of farming practices sometimes permit short-term economic factors to overshadow measures needed for the long-term conservation of the resource base. In the Upper Housatonic River Basin, this is especially evident on a significant portion of the silage corn acreage where steep slopes are farmed with less than optimal conservation practices to retain the soil.

The Berkshire Conservation District has long encouraged farmers in the county to install and maintain conservation practices to conserve soil and water resources. Through the District, Soil Conservation Service technicians are available to advise land users on proper methods to improve crop yields, conserve the soil resource base, and avoid pollution of water resources. Technical assistance is free of charge.

Financial assistance is available through the Agricultural Stabilization and Conservation Service to land users who install approved practices to reduce erosion and sediment from agricultural land. The county Board of Supervisors of ASCS must approve a project for funding and financial assistance is based on a percentage of the installation cost; percentages vary among practices. Technical assistance to plan and design practices is provided by the Soil Conservation Service. The SCS personnel must also certify the installation before financial assistance payments are made by ASCS.

Plan Element: Institute agricultural waste management practices on farms in the watersheds of Onota Lake, Pontoosuc Lake, and Richmond Pond to reduce the amount of nutrients from animal waste delivered to the lakes.

Opportunities for Implementation: Good manure management practices are good common sense use of a valuable resource. Efficient manure utilization can greatly diminish the need for expensive chemical fertilizer while safely disposing of a waste product.

Technical assistance is available from the Soil Conservation Service to help farms develop a good manure disposal strategy that maximizes nutrient benefits while limiting the threat of water pollution. Farmers needing this assistance are encouraged to apply through the Berkshire Conservation District which sets priorities for SCS technical assistance to landowners.

In most cases, low cost or no cost changes in manure handling practices can be suggested that will increase the benefits to the farmer and water resources concurrently.

Plan Element: Implement a program to protect the water quality in the Town Brook aquifer.

Opportunities for Implementation: Protection of the Town Brook aquifer should be a primary concern of the town of Lanesborough. The aquifer offers potential to meet the town's municipal water supply needs for the foreseeable future; the estimated safe yield of the aquifer greatly exceeds the town's projected need through the year 2000 and beyond.

Implementation of zoning bylaws is a municipal function borne by local government. Several towns in eastern Massachusetts have made various efforts toward groundwater protection through zoning bylaws with aquifer protection districts. Some 208 water quality management plans have included model groundwater protection bylaws as study products. These previous efforts could be used by Lanesborough to avoid some of the errors and false starts that others have made.

The Berkshire County Regional Planning Commission may be able to provide assistance and advice in the drafting of an aquifer protection bylaw.

Limitations on the application of roadway de-icing salt will require action by state and local agencies. The Lanesborough highway department crews need to be made aware of the location of aquifer areas that may be especially susceptible to contamination from salt-laden highway runoff.

The Massachusetts Department of Public Works likewise needs to be made aware of the potential hazards of excessive salting of U.S. Route 7 that runs through the Town Brook aquifer area.

Plan Element: Establish public control on three important wetland areas to protect the natural resource value of the areas and to permit public enjoyment of the wetlands.

Opportunities for Implementation: Private property can be purchased for natural resource protection provided that the land is for public use or purposes. Land acquired through outright public purchase is afforded the most protection from development pressures, but is also the most costly method. In periods of tight budget constraints, approval of expenditures of public funds for acquisition of conservation land is difficult.

When funds are scarce, installment purchases might be used to acquire lands. The difference between installment purchases and outright purchases is in timing and not the ultimate interest acquired; when

installment payments are completed, the town will have a fee simple interest in the land. Installment purchase spreads the cost over several years but the debt incurred and resulting interest costs result in a higher total price.

Installment purchase agreements can also apply to the reservation of land or the setting aside of a parcel with a municipal option to buy during a specific time period.

Tax incentives may be used to encourage landowners to retain their property for conservation uses. Techniques such as lowered assessment, or deferral of taxes can be used as incentives. In return for disallowing development on property, a landowner may be granted a lower assessment on his property taxes. Tax deferrals are normally graduated over a specific time period and eventually lead to purchase, bequest, or easement. Deferrals can occur over 5, 10, 20 or 30-year periods with taxes either gradually decreasing to a lower assessment or beginning with a lower assessment and increasing back to the original assessment (whichever is preferred by the landowner). After the time period runs out, a new agreement would need to be developed. Tax deferrals can be complicated by the roles and discretion of the board of assessors and of the agency that desires the land.

Voluntary contractual agreements, such as easements or rights-in-land, are very useful for preserving the natural and sensitive areas. Blanket easements can be used to preserve specific uses or values of the wetlands. Easements must be permanent if the landowner is to receive a lower tax assessment. The cost of an easement may be considerably less than the cost for fee simple acquisition.

Another useful device is that of transferring to a public agency one or more rights from the rights which comprise title to the land. For example, a landowner could relinquish the right to fill or build structures in the wetland property thereby helping to preserve the natural resource values of the land. This transfer of rights is usually combined with a tax incentive agreement to compensate for the loss of some ownership rights.

Restrictive covenants are another useful tool in protecting a resource area. Restrictive covenants are purely voluntary and do not result from government action. The covenant between two or more parties can be used to limit or restrict the use of land to better foster natural resources. Thus, owners of the wetlands could bind themselves and their successors-in-title to specific limitations on the use of their property. This type of wetland protection requires close contact between landowners and community and requires a landowner who can appreciate the value of preserving a natural resource for future generations.

Plan Element: Establish Lake Management Groups for Ashmere Lake, Onota Lake, Pontoosuc Lake, Plunkett Reservoir, and Richmond Pond to enable competing lake interests to communicate and develop acceptable lake management strategies.

Opportunities for Implementation: Most of the identified conflicts between competing lake users could be reduced or eliminated by communication and cooperation among the various user groups. Establishment of a Lake Management Group could be undertaken by any of the suggested group members as indicated in Table 3-1.

Table 3-1

Minimum Composition of Lake Management Groups

Ashmere Lake	Onota Lake
Mass. Dept. of Environmental Management Hinsdale Conservation Commission Mass. Division of Fisheries & Wildlife Ashmere Heights Association	Pittsfield Water Department Pittsfield Conservation Commission Mass. Division of Fisheries & Wildlife Recreational users of the lake representative
Plunkett Reservoir	**Pontoosuc Lake**
Hinsdale Conservation Commission Mass. Division of Fisheries & Wildlife Lake shore property owners representative	Berkshire County Commissioners Pittsfield Conservation Commission Lanesborough Conservation Commission Mass. Division of Fisheries & Wildlife Cottage owners representative
Richmond Pond	
Lakeside Christian Camp (owners of the dam) Richmond Conservation Commission Pittsfield Conservation Commission Mass. Division of Fisheries & Wildlife Richmond Shores Civic Association	

The Soil Conservation Service District Conservationist in the Pittsfield Field Office can offer assistance in organizing a Lake Management Group and discussing some of the issues.

The Massachusetts Division of Water Pollution Control administers the Massachusetts Clean Lakes Program that has as a goal the establishment of a comprehensive program for the restoration, preservation, and maintenance of Massachusetts publicly owned lakes and ponds. This program represents the consolidation of the recently enacted Clean Lakes and Great Ponds Program (Chapter 628 of the Mass. General Laws) and the Nuisance Aquatic Vegetation Control Program (Chapter 722).

The objective of the program is to improve and/or preserve the water quality of publicly owned lakes and ponds for recreation use by the general public. The basic approach involves a diagnostic-feasibility study (Phase I), followed by an Implementation Project (Phase II). One major aspect of the Massachusetts Clean Lakes Program is the determination of the feasibility for restoration, preservation, or maintenance. If it is determined that a certain lake or pond cannot be restored or preserved in a cost effective manner then the lake or pond can be considered under the maintenance program; i.e., the Nuisance Aquatic Vegetation Control Program.

Chapter 628 of the Acts of 1981 allocates $3 million on an annual basis for the program. Funding is also available from Chapter 722 of the Acts of 1969, but is allocated on an annual basis by the Massachusetts legislature. The Division of Water Pollution Control is charged with the establishment of priorities and the allocation of program resources and should be contacted for more detailed information concerning the Massachusetts Clean Lakes Program.

CHAPTER 4

ALTERNATIVES

CHAPTER 4

ALTERNATIVES

This chapter presents several alternative plan components that were considered during the planning process but not included in the Recommended Plan for various reasons.

Problem or Concern: Eutrophication of lakes.

Alternative Considered: Sediment basins.

Discussion: It has been suggested at public meetings and discussions with local residents that sediment basins located upstream of the lakes be constructed to trap sediment and nutrients, particularly phosphorus, and thus prevent the material from entering the lakes. Analyses of this alternative indicated that it would not be practical to construct sediment basins as a measure to reduce the phosphorus load contributed to a lake.

Inflow phosphorus is either dissolved in the streamwater or is attached (absorbed) to particulate matter such as soil particles or organic material. When sediment-laden streamflow moving at some velocity enters a quiet pool of water in a sediment basin, velocity decreases. As a result, the larger, heavier material settles out to the bottom of the basin. Finer-sized sediment such as silt and clay only settles out if enough detention storage is provided to allow sufficient time for settlement to occur. Settling basins are most effective in removing larger-size particles such as sand and gravel and least effective in removing finer materials such as silt and clay.

Unfortunately, most of the attached phosphorus is associated with the clay and silt and organic material. A sediment basin, is, therefore, least effective in removing those particles with the most attached phosphorus. In addition, the sedimentation process occurring in a sediment basin has little effect on the removal of phosphorus dissolved in the water.

An analysis was made of a potential sediment basin that might be located at the Town Brook inlet to Pontoosuc Lake at Bull Hill Road in Lanesborough, using a procedure presented in SCS Technical Release 12, "Sediment Storage Requirements for Reservoirs." A sediment basin which flooded 65 acres of area would reduce inflow sediment about 24 percent and reduce inflow phosphorus to Pontoosuc Lake by about 14 percent. Construction of a larger sediment basin that flooded 200 acres would remove about 87 percent of the inflow sediment while only removing about 34 percent of the inflow phosphorus.

In summary, although sediment basins may remove almost all of the inflow sediment, phosphorus removal rates are significantly lower. For Pontoosuc Lake, a 200 acre sediment basin (the Lake itself covers less than 500 acres) would be required to remove slightly over one-third of the inflow phosphorus.

Problem or Concern: Eutrophication of lakes.

Alternative Considered: Streambank stabilization.

Discussion: Ten areas of accelerated streambank erosion were noted in the Town Brook watershed. These areas are estimated to contribute about 26 tons of sediment to Pontoosuc Lake each year.

Streambank erosion can be both geologic (naturally occurring) and accelerated by human activities. Geologic erosion cannot be effectively reduced but excessive erosion due to non-geologic activity can be controlled.

In several areas of the streams, debris dams composed of trees and brush have blocked the channel and caused excessive erosion of streambanks. Removal of the logs and debris can allow the brook to reestablish its channel within the original banks.

Where bank erosion has cut into the banks, plantings can often be established to curtail further bank erosion. Where banks cannot be stabilized by vegetation due to high banks or excessive velocity, rock riprap protection is often required.

Soil Conservation Service technicians and geologists inventoried each critical erosion area along Town Brook and formulated a measure treatment that might be used to control the erosion.

Table 4-1 presents a summary of the streambank protection measures that were considered.

Table 4-1

Town Brook Streambank Protection Measures

Area	Treatment Measure and Quantity			Estimated Cost
	Seeding (square feet)	Plantings (linear feet)	Riprap (linear feet)	($)
1			400	40,000
2		25	25	3,500
3	5,000	20	750	41,000
4		55		1,500
5		50		1,300
6	200	200		5,300
7		100	100	26,000
8		50		1,300
9			25	6,000
10	2,000	300		8,300
Total	7,200	800	1,300	$134,000

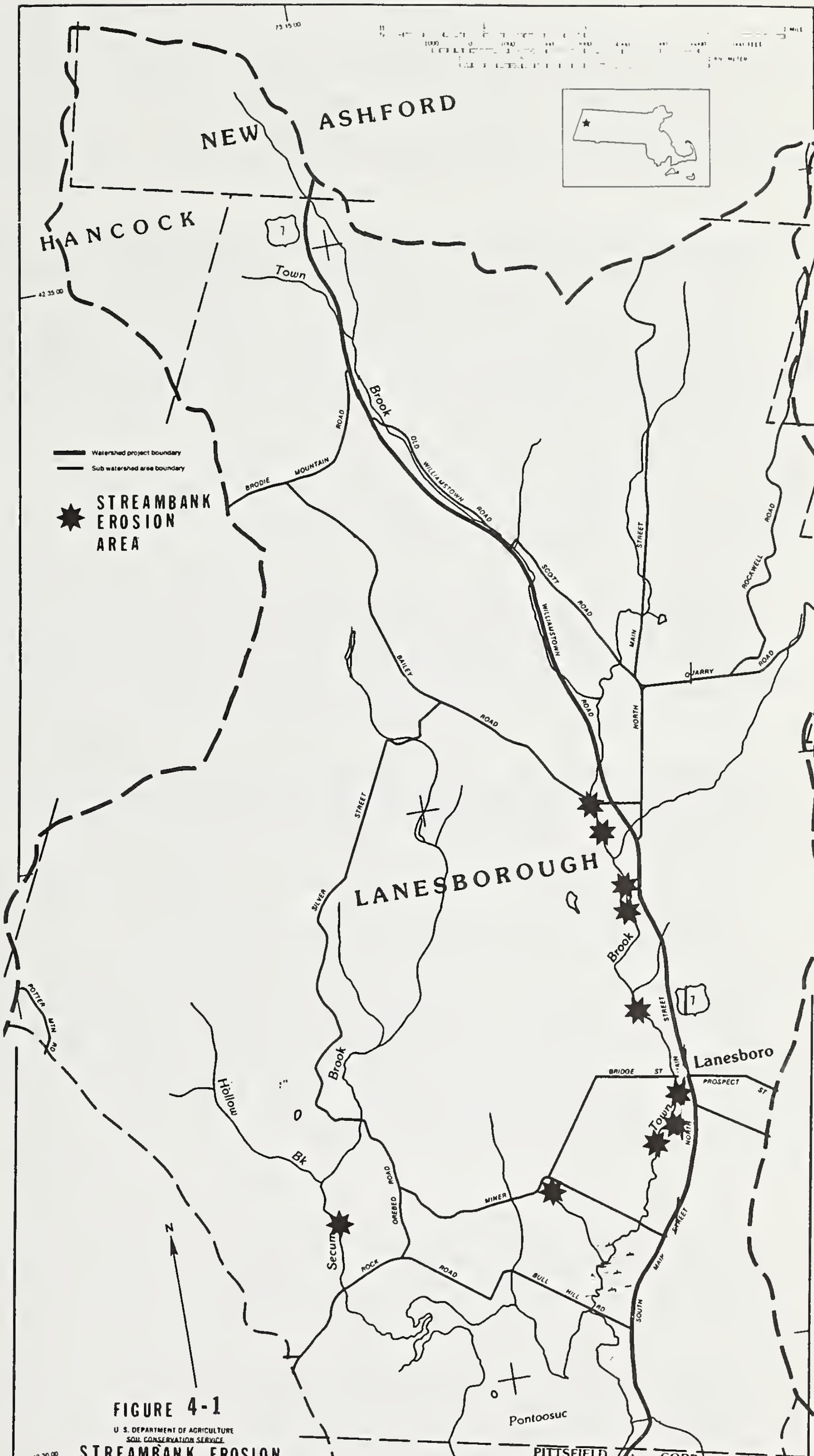


FIGURE 4-1
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
STREAMBANK EROSION AREAS
PONTOOSUC LAKE
UPPER HOUSATONIC WATERSHED
BERKSHIRE COUNTY, MASSACHUSETTS

The 208 study developed data concerning the cost effectiveness of various phosphorus reduction measures by determining the cost to prevent 1 kilogram of phosphorus from reaching the lake. In 1976, the costs ranged from $10 to $1900 per kilogram of phosphorus. Inflation raised the Engineering News Record Construction Index from 2305 in January 1976 to 4006 in April 1983 indicating a current range of $17 to $3300 per kilogram of phosphorus for the range of alternatives investigated by the 208 study.

Streambank erosion in the Town Brook watershed is estimated to contribute 26 tons of sediment and about 21 kilograms of phosphorus to Pontoosuc Lake. The cost to prevent 1 kilogram of phosphorus from streambank erosion from reaching the lake is about $6400 or about twice the most expensive measure considered by the 208 study. Thus, this river basin study concluded that streambank erosion measures were not economically viable from a phosphorus reduction viewpoint.

Problem or Concern: Multiple use of lakes.

Alternative Considered: Lake drawdown.

Discussion: To some extent, lake drawdown was mentioned as a problem or concern complicating multiple use of each of the lakes. Historically, the lakes were drawn down for flood control and dam safety. In recent years, winter drawdown for weed control has been utilized at some lakes. Conflict have developed when drawdown was perceived to interfere with recreational use of a lake or impair fish and wildlife habitat in or around a lake.

Drawdown for weed control involves subjecting freeze-susceptible weeds to low temperatures for a sufficiently long period to destroy the plants. The time period required is relatively short in relation to the winter season.

Winter drawdown for dam safety is primarily performed to protect the dam from damage from sheets of ice. The period of drawdown thus is the portion of the winter when ice is on the lake.

Lowering the lake level provides reservoir storage volume that can be utilized to store floodwaters and reduce downstream flood peaks. The New Year's Eve flood of 1948-49 serves as a good example of the potential benefits of reservoir drawdown for flood control as Onota and Pontoosuc Lakes were drawn down at the time of the storm and reduced flood peaks on the West Branch of the Housatonic.

In the case of Onota and Pontoosuc Lakes, significant flood plain developme has occurred downstream of the lakes and lowering the lake level offers a l cost method of providing a degree of flood protection to that development. Outflow from Richmond Pond joins Shaker Brook to form the Southwest Branch the Housatonic River. Winter drawdown of the pond provides an opportunity for low cost flood storage for the Southwest Branch.

Plunkett Reservoir and Ashmere Lake provide a significantly different situation. The outflow from Plunkett Reservoir forms Frisell Brook which flows about 4000 feet before entering the East Branch of the Housatonic River. The flood plain is relatively undeveloped. Frisell Brook contributes about 12 percent of the total East Branch drainage area at the confluence. Because of these factors, drawdown of Plunkett Reservoir for flood control does not provide the readily apparent flood prevention benefits that accrue from similar programs at Onota and Pontoosuc Lakes.

Likewise, Ashmere Lake which outflows into Bennett Brook and flows for about 3 miles before entering the East Branch of the Housatonic has a relatively undeveloped flood plain. Bennett Brook meets the East Branch in a large wetland area locally known as Hinsdale flats, a natural flood storage area. Drawdown of Ashmere Lake is not likely to provide significant monetary flood control benefits.

Since Onota Lake, Pontoosuc Lake, and Richmond Pond offer the best potential for winter drawdown for flood control, these three lakes were examined in more detail.

In order for drawdown to be effective in reducing flood peaks downstream, the lake must be drawn down prior to the occurrence of the flood and the volume of drawdown must be significant in relation to the volume of runoff in the flood. From a strictly flood control viewpoint, the lake level should be drawn down at all times to insure the availability of flood storage if needed. Such a year-round drawdown would probably be an unpopular action; but statistical data indicates a high probability of flood-producing rainfalls occurring during the late summer and early fall--the hurricane season.

Rainfall is not the sole factor determining if a flood occurs. Direct runoff, or the portion of the rainfall that quickly results in streamflow, is an important determinant of the severity of flooding. Rain falling on frozen ground and becoming nearly 100 percent runoff can be much more severe than a summer storm of the same rainfall.

In view of these factors, it is more reasonable to assume that the probability of damaging floods is quite uniform throughout the year with a drop in probability during May, June, and November. Thus, if the lake level were to be managed primarily for flood control, the flood storage volume should be available throughout most of the year.

The question of how far the lake should be drawn down to be effective for flood control is also a many-faceted issue. If the volume of flood storage made available through drawdown is insignificant in relation to the volume of flood runoff, the reduction in flood peak will be minimal. Likewise, a particular drawdown may be effective in controlling a small flood but be ineffective in storing a significant portion of a larger flood. Unfortunately, before the flood is over, it is nearly impossible to accurately estimate the volume of flood storage needed for that particular storm. Therefore, synthetic storms of varying frequencies or percent chance of exceedance are commonly used to design flood storage volume requirements.

In order to provide a range of alternatives to be considered in developing a drawdown plan, a 50 percent, 10 percent, and 1 percent chance--24-hour duration storm were selected to provide comparisons. The runoff expected from these storms would be about 0.5, 1.5, and 3.3 inches respectively. If essentially the total storm runoff volume could be stored at the drawdown lake, maximum protection could be provided to the downstream areas. To provide the desired volume of flood storage would require the lake to be drawn down as indicated in Table 4-2.

TABLE 4-2

Drawdown Required to Store Floodwater Volume from Various Frequency Storms

Percent Chance Flood	Onota Lake		Pontoosuc Lake		Richmond Pond	
	Volume to Store (AF)	Drawdown Necessary to Store Indicated Volume (Feet)	Volume to Store (AF)	Drawdown Necessary to Store Indicated Volume (Feet)	Volume to Store (AF)	Drawdown Necessary to Store Indicated Volume (Feet)
50	280	0.5	580	1.5	200	1.0
10	820	1.4	1730	4.0	600	3.0
1	1810	3.2	3800	10.0*	1320	9.0 *

*Spillway modifications will be necessary.

Concern has been expressed that if the drawdown time were extended to late spring, the lake might not have enough inflow to allow it to refill before the recreation season. To address this concern, a series of water budget computations were made to determine the latest date that the lake could have remained drawn down to a specific level and refill by June 1. Results of the water budget computations are presented in Table 4-3. Calculations were made for the period 1961 through 1969 that included the severe Northeast drought to illustrate what might have happened if the lake were drawn down and allowed to refill in different time periods.

The data in Table 4-3 are presented with the assumption that various downstream releases would be made available to avoid drying up the downstream brook and to provide for the needs of fish, biota, and aesthetic considerations. In-stream flow needs for northeast streams have not been conducively defined but the range represented in Table 4-3 probably indicates a minimum range of desirable downstream releases.

Lake drawdown for flood control can be separated into some interrelated questions:

(1) When should the lake be drawn down?

(2) How much should the lake be drawn down?

(3) When should refilling begin?

The data in the preceding discussion give some suggestions that can be explored in developing a reservoir management plan. The suggestions are presented for consideration by the local and state interests involved.

REFILLING BEGINS APRIL 1

DOWNSTREAM RELEASE= .0 cfs

1961	1962	1963	1964	1965	1966	1967	1968	1969
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES

DOWNSTREAM RELEASE= 5.4 cfs

DRAW-DOWN	1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	YES	YES	YES	YES	YES	YES	YES	YES	YES
4	YES	YES	YES	YES	YES	YES	YES	YES	YES
5	YES	YES	YES	YES	YES	YES	YES	YES	YES
6	YES	YES	YES	YES	YES	YES	YES	YES	YES
7	YES	YES	YES	YES	YES	YES	YES	YES	YES
8	YES	YES	YES	YES	YES	YES	YES	YES	YES
9	YES	YES	YES	YES	YES	YES	YES	YES	YES
10	YES	YES	YES	YES	YES	NO	YES	YES	YES

DOWNSTREAM RELEASE=10.8 cfs

YEAR

1961	1962	1963	1964	1965	1966	1967	1968	1969
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	NO	YES	YES	YES
YES	YES	YES	YES	YES	NO	YES	YES	YES
YES	YES	YES	YES	YES	NO	YES	YES	YES

DOWNSTREAM RELEASE=16.2 cfs

YEAR

DRAW-DOWN	1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	YES	YES	YES	YES	YES	YES	YES	YES	YES
4	YES	YES	YES	YES	YES	YES	YES	YES	YES
5	YES	YES	YES	YES	YES	YES	YES	YES	YES
6	YES	YES	YES	YES	YES	NO	YES	YES	YES
7	YES	YES	YES	YES	YES	NO	YES	YES	YES
8	YES	YES	YES	YES	YES	NO	YES	YES	YES
9	YES	YES	YES	NO	YES	NO	YES	NO	YES
10	YES	YES	YES	NO	NO	NO	YES	NO	YES

REFILLING BEGINS MAY 1

DOWNSTREAM RELEASE= .0 cfs

YEAR

1961	1962	1963	1964	1965	1966	1967	1968	1969
YES	YES	YES	YES	YES	YES	YES	YES	YES
YES	YES	YES	NO	YES	YES	YES	YES	YES
YES	YES	YES	NO	YES	YES	YES	YES	YES
YES	YES	YES	NO	NO	YES	YES	YES	YES
YES	NO	YES	NO	NO	YES	YES	NO	YES
YES	NO	NO	NO	NO	NO	YES	NO	YES
YES	NO	NO	NO	NO	NO	YES	NO	YES
NO	NO	NO	NO	NO	NO	YES	NO	YES
NO	NO	NO	NO	NO	NO	YES	NO	NO
NO	NO	NO	NO	NO	NO	NO	NO	NO

DOWNSTREAM RELEASE= 5.4 cfs

YEAR

DRAW-DOWN	1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	NO	YES	YES	YES	YES	YES
3	YES	YES	YES	NO	NO	YES	YES	YES	YES
4	YES	NO	YES	NO	NO	YES	YES	NO	YES
5	YES	NO	NO	NO	NO	NO	YES	NO	YES
6	YES	NO	NO	NO	NO	NO	YES	NO	YES
7	NO	NO	NO	NO	NO	NO	YES	NO	YES
8	NO	NO	NO	NO	NO	NO	YES	NO	NO
9	NO	NO	NO	NO	NO	NO	NO	NO	NO
10	NO	NO	NO	NO	NO	NO	NO	NO	NO

DOWNSTREAM RELEASE=10.8 cfs

YEAR

1961	1962	1963	1964	1965	1966	1967	1968	1969
YES	YES	YES	NO	YES	YES	YES	YES	YES
YES	YES	YES	NO	NO	YES	YES	YES	YES
YES	NO	YES	NO	NO	YES	YES	NO	YES
YES	NO	YES	NO	NO	NO	YES	NO	YES
YES	NO	NO	NO	NO	NO	YES	NO	YES
NO	NO	NO	NO	NO	NO	YES	NO	YES
NO	NO	NO	NO	NO	NO	YES	NO	NO
NO	NO	NO	NO	NO	NO	NO	NO	NO
NO	NO	NO	NO	NO	NO	NO	NO	NO
NO	NO	NO	NO	NO	NO	NO	NO	NO

DOWNSTREAM RELEASE=16.2 c

YEAR

DRAW-DOWN	1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	NO	NO	YES	YES	YES	YES
2	YES	YES	YES	NO	NO	YES	YES	YES	YES
3	YES	NO	YES	NO	NO	NO	YES	NO	YES
4	YES	NO	NO	NO	NO	NO	YES	NO	YES
5	NO	NO	NO	NO	NO	NO	YES	NO	YES
6	NO	NO	NO	NO	NO	NO	YES	NO	NO
7	NO	NO	NO	NO	NO	NO	NO	NO	NO
8	NO	NO	NO	NO	NO	NO	NO	NO	NO
9	NO	NO	NO	NO	NO	NO	NO	NO	NO
10	NO	NO	NO	NO	NO	NO	NO	NO	NO

ble indicates if the reservoir would have refilled by June 1 of the indicated year th the specified downstream release rate and the specified drawdown, in feet.

REFILLING BEGINS APRIL 1

DOWNSTREAM RELEASE= .0 cfs

DRAW-DOWN	1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	YES	YES	YES	YES	YES	YES	YES	YES	YES
4	YES	YES	YES	YES	YES	.	YES	YES	YES

DOWNSTREAM RELEASE= 5.1 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	YES	YES	YES	YES	YES	.	YES	YES	YES
4	YES	YES	YES	.	.	.	YES	.	YES

DOWNSTREAM RELEASE=10.3 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	.	YES	YES	YES
3	YES	YES	YES	.	.	.	YES	.	YES
4	.	YES	.	.	.	.	YES	.	YES

DOWNSTREAM RELEASE

DRAW-DOWN	1961	1962	1963	1964	1965	1966	1967	1
1	YES	YES	YES	YES	YES	YES	YES	Y
2	YES	YES	YES	YES	YES	YES	YES	Y
3	YES	YES	YES	YES	YES	.	YES	Y
4	YES	YES	YES	.	.	.	YES	

DOWNSTREAM RELEASE

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1
1	YES	YES	YES	YES	YES	YES	YES	YI
2	YES	YES	YES	YES	YES	.	YES	YI
3	YES	YES	YES	.	.	.	YES	.
4	YES	YES	YES	.	.	.	YES	.

REFILLING BEGINS MAY 1

DOWNSTREAM RELEASE= .0 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	.	.	YES	YES	YES	YES
2	YES	.	.	.	.	.	YES	.	YES
3	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.

DOWNSTREAM RELEASE= 5.1 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	.	YES	.	.	YES	YES	YES	YES
2	.	.	.	.	.	.	YES	.	.
3	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.

DOWNSTREAM RELEASE=10.3 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	.	.	.	.	.	YES	.	YES
2	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.

DOWNSTREAM RELEASE=

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	19
1	YES	YES	YES	.	.	YES	YES	YE
2	YES	.	.	.	.	.	YES	.
3	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.

DOWNSTREAM RELEASE=

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	19
1	YES	.	YES	.	.	.	YES	.
2	.	.	.	.	.	.	YES	.
3	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.

Table indicates if the reservoir would have refilled by June 1 of the indicated year with the specified downstream release rate and the specified drawdown, in feet.

REFILLING BEGINS APRIL 1

DOWNSTREAM RELEASE= .0 cfs

DRAW-DOWN	1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	YES	YES	YES	YES	YES	YES	YES	YES	YES
4	YES	YES	YES	YES	YES	YES	YES	YES	YES
5	YES	YES	YES	YES	YES	YES	YES	YES	YES
6	YES	YES	YES	YES	YES	YES	YES	YES	YES
7	YES	YES	YES	YES	YES	YES	YES	YES	YES
8	YES	YES	YES	YES	YES	YES	YES	YES	YES
9	YES	YES	YES	YES	YES	YES	YES	YES	YES
10	YES	YES	YES	YES	YES	YES	YES	YES	YES

DOWNSTREAM RELEASE= 1.9 cfs

DRAW-DOWN	1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	YES	YES	YES	YES	YES	YES	YES	YES	YES
4	YES	YES	YES	YES	YES	YES	YES	YES	YES
5	YES	YES	YES	YES	YES	YES	YES	YES	YES
6	YES	YES	YES	YES	YES	YES	YES	YES	YES
7	YES	YES	YES	YES	YES	YES	YES	YES	YES
8	YES	YES	YES	YES	YES	YES	YES	YES	YES
9	YES	YES	YES	YES	YES	.	YES	YES	YES
10	YES	YES	YES	YES	YES	.	YES	YES	YES

DOWNSTREAM RELEASE= 3.8 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	YES	YES	YES	YES	YES	YES	YES	YES	YES
4	YES	YES	YES	YES	YES	YES	YES	YES	YES
5	YES	YES	YES	YES	YES	YES	YES	YES	YES
6	YES	YES	YES	YES	YES	YES	YES	YES	YES
7	YES	YES	YES	YES	YES	.	YES	YES	YES
8	YES	YES	YES	YES	YES	.	YES	YES	YES
9	YES	YES	YES	YES	YES	.	YES	.	YES
10	YES	YES	YES	.	.	.	YES	.	YES

DOWNSTREAM RELEASE= 5.6 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	YES	YES	YES	YES	YES	YES	YES	YES	YES
4	YES	YES	YES	YES	YES	YES	YES	YES	YES
5	YES	YES	YES	YES	YES	.	YES	YES	YES
6	YES	YES	YES	YES	YES	.	YES	YES	YES
7	YES	YES	YES	YES	YES	.	YES	.	YES
8	YES	YES	YES	.	.	.	YES	.	YES
9	YES	YES	YES	.	.	.	YES	.	YES
10	YES	YES	YES	.	.	.	YES	.	YES

REFILLING BEGINS MAY 1

DOWNSTREAM RELEASE= .0 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	.	YES	YES	YES	YES	YES
3	YES	YES	YES	.	.	YES	YES	YES	YES
4	YES	.	YES	.	.	YES	YES	.	YES
5	YES	.	.	.	.	.	YES	.	YES
6	YES	.	.	.	.	.	YES	.	YES
7	.	.	.	.	.	.	YES	.	.
8	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.

DOWNSTREAM RELEASE= 1.9 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	.	YES	YES	YES	YES	YES
2	YES	YES	YES	.	.	YES	YES	YES	YES
3	YES	.	YES	.	.	YES	YES	.	YES
4	YES	.	.	.	.	.	YES	.	YES
5	YES	.	.	.	.	.	YES	.	YES
6	.	.	.	.	.	.	YES	.	.
7	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.

DOWNSTREAM RELEASE= 3.8 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	.	YES	YES	YES	YES	YES
2	YES	YES	YES	.	.	YES	YES	YES	YES
3	YES	.	YES	.	.	.	YES	.	YES
4	YES	.	.	.	.	.	YES	.	YES
5	.	.	.	.	.	.	YES	.	.
6	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.

DOWNSTREAM RELEASE= 5.6 cfs

DRAW-DOWN	YEAR 1961	1962	1963	1964	1965	1966	1967	1968	1969
1	YES	YES	YES	.	.	YES	YES	YES	YES
2	YES	.	YES	.	.	YES	YES	.	YES
3	YES	.	.	.	.	.	YES	.	YES
4	.	.	.	.	.	.	YES	.	YES
5	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.

able indicates if the reservoir would have refilled by June 1 of the indicated year
ith the specified downstream release rate and the specified drawdown, in feet.

To provide the maximum degree of flood prevention capability, the lake should be drawn down throughout the year. Damaging floods can occur at any time but are most likely to occur during the hurricane season and during the winter. The multi-purpose use of the lake for recreation effectively precludes year-round drawdown without significant impacts upon lake users. Drawdown of the lakes might begin soon after Labor Day to avoid recreation conflicts and provide flood protection throughout the remainder of the hurricane season and winter months. Relatively early drawdown will also enable the fish and wildlife of the lake to better adjust to lower lake level before cold weather begins.

Problem or Concern: Multiple use of lakes.

Alternative Considered: Regulation of motorboat use of lakes.

Discussion: Another common concern involving conflicting uses of some of the smaller lakes revolves around use by power boaters and water skiers. It was noted that boaters sometimes interfere with other users of the lake and some restriction of boat operation was suggested.

Massachusetts communities have the option of limiting boat operation. Basically, the procedure involves the community holding an advertised public hearing to solicit public input and then developing a bylaw or ordinance that specifies the restrictions, the penalties, and the agencies that can enforce the regulation. The Division of Marine and Recreational Vehicles in the Department of Fisheries, Wildlife, and Recreational Vehicles must also approve the bylaw or ordinance.

Problem or Concern: Water supply.

Alternative Considered: Potential reservoir sites.

Discussion: The Soil Conservation Service has completed and published an inventory of potential reservoir sites for the entire Housatonic River Basin in Massachusetts. Reservoir locations were selected on the basis of suitable topography, relatively undeveloped pool areas, and certain drainage area, pool area, and storage characteristics. Inventory data which were prepared included a surficial geologic investigation, list of man-made facilities which would be inundated and preliminary designs and cost estimates for various levels of development.

The inventories provide a valuable source of basic information on potential reservoir sites in the region. No attempt was made in the inventories to evaluate the potential of the sites for specific purposes such as water supply, recreation, etc. Unfortunately, many of the reservoir sites that first appeared promising fail to meet the more stringent criteria required for a good water supply reservoir. Among the more common problems are poor geologic conditions, recent development of the pool area, and extremely high cost.

In 1977, USDA published, "Water and Related Land Resources of the Berkshire Region," that included an Appendix presenting the most promising potential reservoir sites in the Berkshire region. The inventories of potential sites were used as the source of basic data. Many of the original sites were eliminated from further consideration because of obvious problems connected with geologic conditions and extensive effects on man-made facilities.

The remaining sites were individually evaluated for potential uses.

Table 4-4 presents updated information concerning the 20 potential reservoir sites identified in the Upper Housatonic Basin.

Basic data and updated land use information concerning the reservoir sites were provided to the corps of Engineers for use in their urban study of the Housatonic River.

The data are presented in Table 4-4 to alert local residents and officials to possible alternative water supply sources. The region is currently placing emphasis on developing groundwater resources rather than surface water but acquisition or protection of these potential reservoir sites should be considered to insure that the resource is available if groundwater is not available due to contamination.

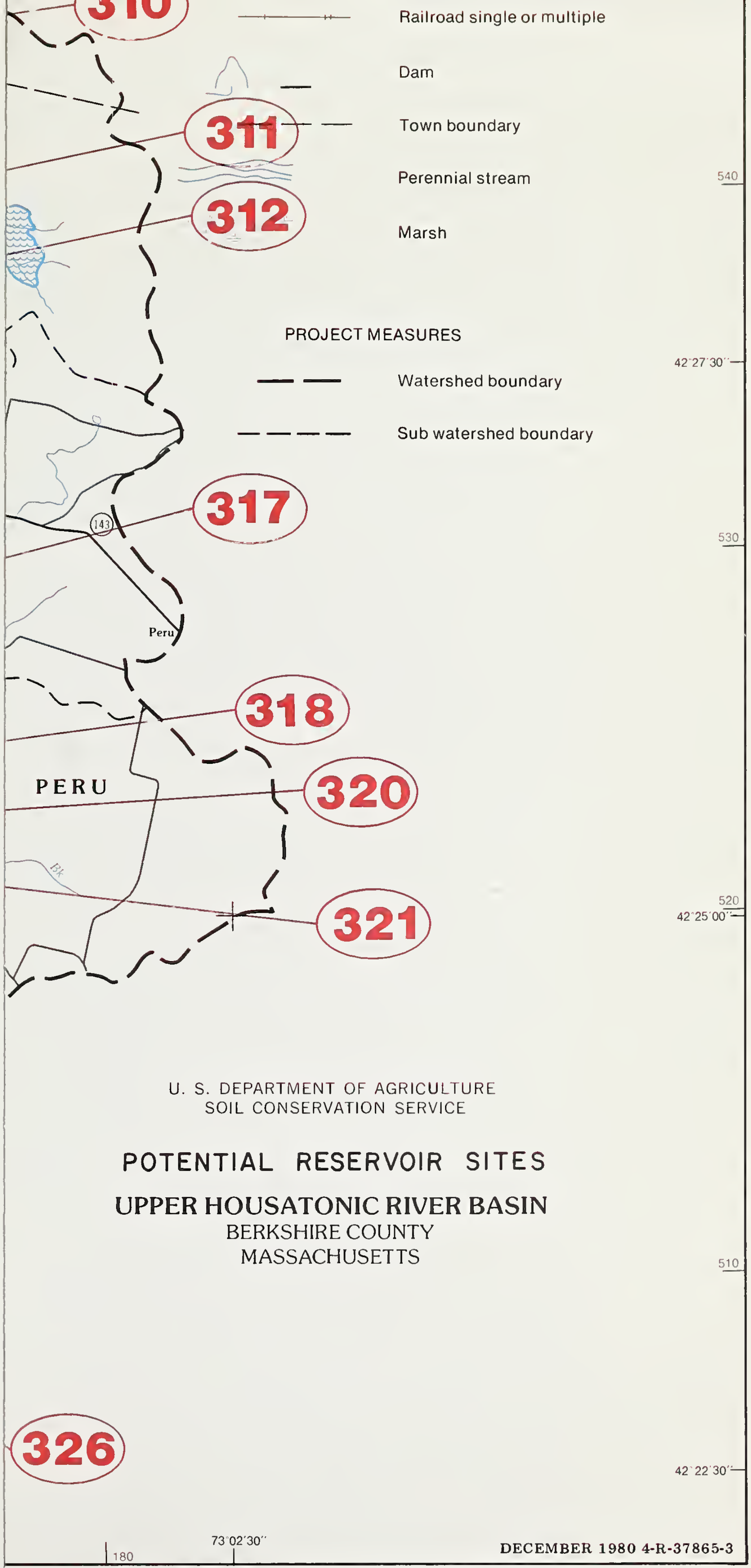
Table 4-4

Potential Reservoir Sites Within the Upper Housatonic Basin

Site Number	Municipality	Drainage Area (Sq. Mi.)	Potential Developments Elevation (Ft.)	Surface Area (Acres)	Volume (A.F.)	Safe Yield (MGD)	Facilities Affected Elevation (Ft.)	Facility	Remarks
HO-0101	Lanesborough	2.3	1224	11	100	0.3	1262	House	Site is located
			1244	59	790	1.2	1245	House	the tertiary rec
			1266	112	2600	2.0	1230	House	area of the Town
							1225	House	aquifer, the wat
							1220	2 Houses	for Lanesborough
							1215	No. Main St.	
							1205	Scott Rd.	
HO-0107	Pittsfield	2.6	1107	18	110	0.4	1140	5 Houses	The site is imme
			1124	72	840	1.4	1130	6 Houses	upstream of Onot
			1144	134	2910	2.2	1110	7 Houses	an emergency wat
							1105	9 Houses	Development of t
							1105	Peck Rd.	as a water suppl
									not appear pract
									Development has
									in the pool area
HO-110	Pittsfield	2.0	1130	35	199	0.5	1145	Cascade Rd.	The site is immed
			1142	92	1000	1.3	1135	Camp	upstream of Onot
			1152	130	2120	1.7	1130	House	an emergency wat
							1125	House	Development of th
							1120	House & Barn	as a water suppl
									not appear pract
HO-206	Pittsfield	1.0	1103	19	110	0.2	1135	3 Houses	The site is locat
			1115	36	425	0.6	1125	Barker Rd.	mediately downst
			1129	52	1050	0.8			from the Muddy Po
									wetland.
HO-301	Windsor	0.9	1972	11	105	0.2		None	
			1983	29	355	0.5			
			1995	65	940	0.7			
HO-303	Windsor	1.8	1890	54	390	0.7	1910	Savoy Rd.	The site is within
			1899	100	980	1.1			Moran Wildlife Mar-
			1908	139	1920	1.5			ment Area.
HO-305	Windsor	3.5	1850	19	160	0.6	1890	Savoy Rd.	This site would fl
			1867	85	1050	1.8	1870	Bosina Rd.	part of the Moran
			1886	220	3800	3.0			life Management Ar
HO-307	Windsor	7.0	1747	15	100	0.7	1810	Berkshire Trail (Rt. 9)	
			1784	80	1790	3.3	1760	House & Barn	
			1819	164	5880	5.5	1740	Dalton Rd.	
HO-310	Hinsdale	3.6	1524	13	100	0.4	1545	New Windsor Rd.	
			1560	63	1240	2.0			
			1584	107	3220	2.9			
HO-311	Hinsdale	2.5	1620	27	150	0.5		None	
			1629	39	435	0.9			
			1639	45	850	1.3			
HO-312	Peru	1.5	1880	16	100	0.3		None	
			1894	43	475	0.8			
			1912	87	1630	1.2			

Table 4-4. Potential Reservoir Sites Within the Upper Housatonic Basin (contd)

Site Number	Municipality	Drainage Area (Sq. Mi.)	Potential Developments: Elevation (Ft.)	Surface Area (Acres)	Volume (A.F.)	Safe Yield (MGD)	Facilities Affected: Elevation (Ft.)	Facility	Remarks
0-7	Hinsdale	1.7	1528	11	100	0.3	1565	Road	
			1549	49	660	0.9	1540	Campground	
			1568	82	1870	1.4			
0-9	Hinsdale	17.9	1435	730	3750	8.0	1437	Bullards Crossing Rd.	The site would flood the regionally important Hinsdale Flats wetland area.
							1430	Railroad	
0-0	Hinsdale	2.7	1520	34	185	0.5	1540	Shed	
			1529	54	570	1.0	1535	Fassell Rd.	
			1539	71	1200	1.5			
0-1	Peru	0.9	1552	32	190	0.3		None	This site is essentially an enlargement of Tracy Pond.
			1561	41	510	0.6			
			1569	52	895	0.7			
0-3	Washington	0.7	1800	15	105	0.2		None	
			1810	27	320	0.4			
			1821	54	775	0.6			
0-24	Hinsdale	1.6	1538	19	110	0.3	1520	Barn & Sheds	
			1554	39	615	0.9			
			1564	48	949	1.0			
0-25	Hinsdale	3.5	1445	216	1220	1.9	1446	Railroad	This site would flood a large wetland area.
							1445	2 Houses	
							1440	Valley Rd.	
							1440	3 Houses	
0 26	Hinsdale	0.9	1561	16	110	0.2	1590	House	
							1580	Dirt road	
			1569	27	275	0.4	1540	Fassell Rd.	
			1588	51	1000	0.8			
0 10	Washington	1.0	1902	20	110	0.2		None	This site is located downstream of Ashley Lake. The drainage area may not be sufficient to maintain both pools during dry months.
			1908	37	270	0.5			
			1920	94	1040	0.8			



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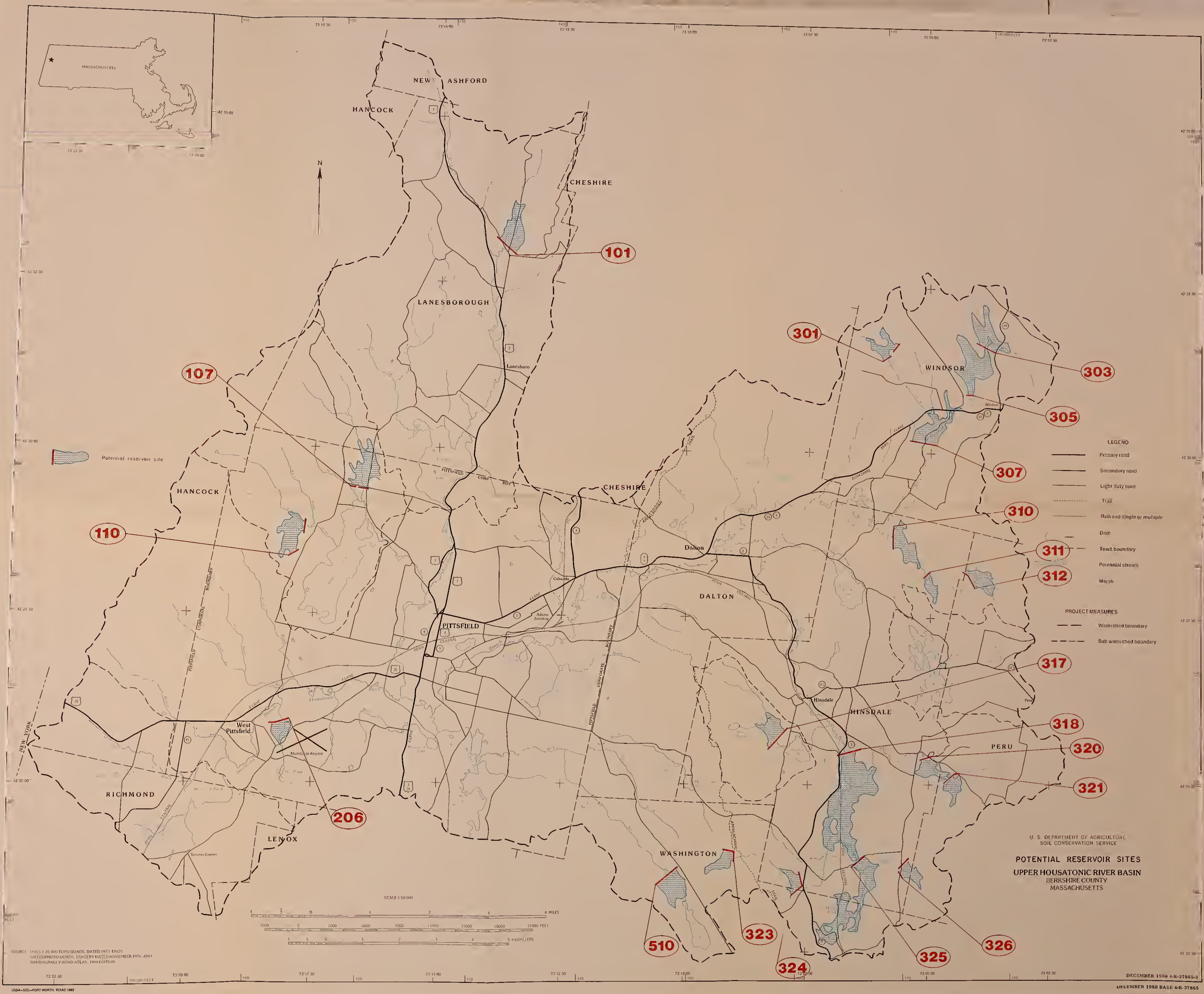
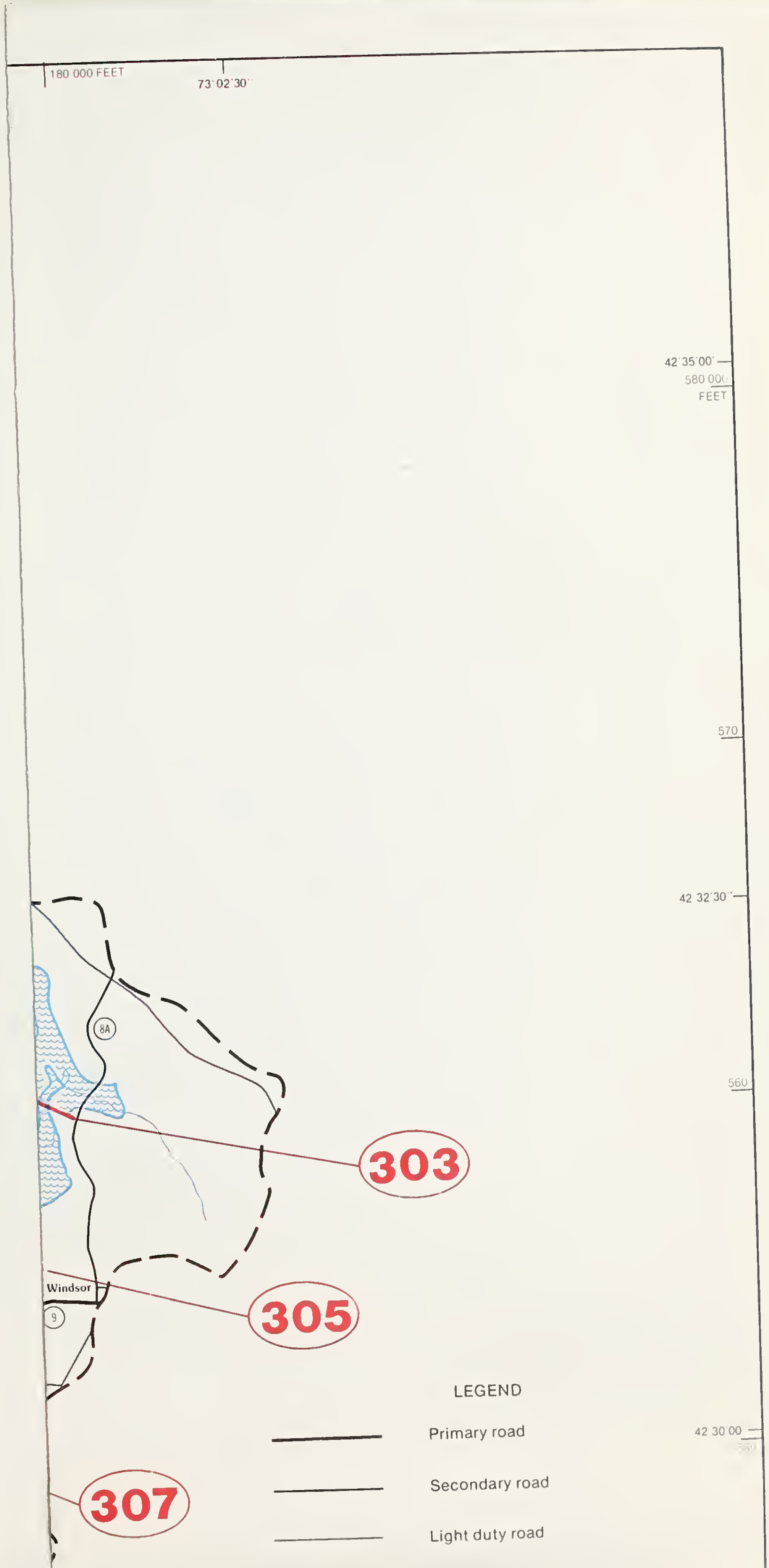

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
POTENTIAL RESERVOIR SITES
UPPER HOUSATONIC RIVER BASIN
BERKSHIRE COUNTY
MASSACHUSETTS
LEGEND
Primary road
Secondary road
Light duty road
Trail
Railroad single or multiple
Dam
Town boundary
Perennial stream
Marsh
PROJECT MEASURES
Watershed boundary
Sub watershed boundary
Potential reservoir site
MASSACHUSETTS
N
NEW ASHFORD
HANCOCK
CHESHIRE
LANESBOROUGH
Lanesboro
HANCOCK
CHESHIRE
WINDSOR
Windsor
Dalton
DALTON
PITTSFIELD
Coltsville
Adams Junction
West Pittsfield
Municipal Airport
RICHMOND
LENOX
Stevens Corner
WASHINGTON
HINSDALE
Hinsdale
PERU
Peru
NEW YORK
PITTSFIELD CORPORATE BOUNDARY
PITTSFIELD CORP BDY
101
107
110
206
301
303
305
307
310
311
312
317
318
320
321
323
324
325
326
510
SCALE 1:50 000
4 MILES
21000 FEET
5 KILOMETERS
SOURCE USGS 1:25 000 TOPO QUADS, DATED 1973 USGS
ORTHOPHOTO QUADS, IMAGERY DATED NOVEMBER 1976 AND
RAND McNALLY ROAD ATLAS, 1980 EDITION
DECEMBER 1980 4-R-37865-3
DECEMBER 1980 BASE 4-R-37865
USDA–SCS–FORT WORTH, TEXAS 1982


180 000 FEET
73°02'30"
42°35'00"
580 000
FEET
570
42°32'30"
560
42°30'00"
8A
303
Windsor
9
305
307
LEGEND
Primary road
Secondary road
Light duty road

APPENDIX A

RESOURCE BASE

STUDY AREA LOCATION

The Upper Housatonic River Basin encompasses a drainage area of 144.7 square miles (92,600 acres) and is located entirely in central Berkshire County. The city of Pittsfield is almost entirely within the Basin, and is the center of economic activity. Eleven municipalities are partially within the study area, but only eight have significant portions of their area within the drainage area. The city of Pittsfield plus the towns of Hinsdale, Lanesborough, and Dalton account for 71 percent of the Basin area. Figure A-1 is a general location map of the Basin.

The Basin is designated hydrologic unit number 01100005 by the U.S. Water Resources Council. The Basin includes the drainage areas of the East, West, and Southwest Branches of the Housatonic as well as a portion of the river's main stem. The confluence of the Southwest and West Branches forms the Housatonic River in the southern part of Pittsfield. The Basin lies in close proximity to several major population centers in the northeast such as: Albany, 40 miles west; Hartford, 80 miles southeast; and Boston, 140 miles east.

CLIMATE

The area has a humid climate and annual temperature characteristic of the North Temperate Zone. The mean annual temperature is about 46°F. Record temperatures are a high of 95°F and a low of -25°F recorded at the Pittsfield airport.

Weather patterns alternate roughly twice-weekly from fair to cloudy or stormy conditions, alternated by often abrupt changes. There is no regular weather pattern, but it is infrequent for any pattern to continue for several weeks. Changeability is the most normal characteristic, and a "normal" month, season, or year is indeed the exception rather than the rule.

The growing season varies from 120 to 140 days. The frost-free period is from mid or late May until late September. These dates vary greatly from year to year with freezing temperatures lasting well into June in an unusually cold spring.

Precipitation averages about 46 inches annually, and is rather evenly distributed throughout the year. Average monthly precipitation is shown in Figure A-2.

Figure 1

UPPER HOUSATONIC RIVER BASIN

Base map courtesy of the Massachusetts Department of Public Works.

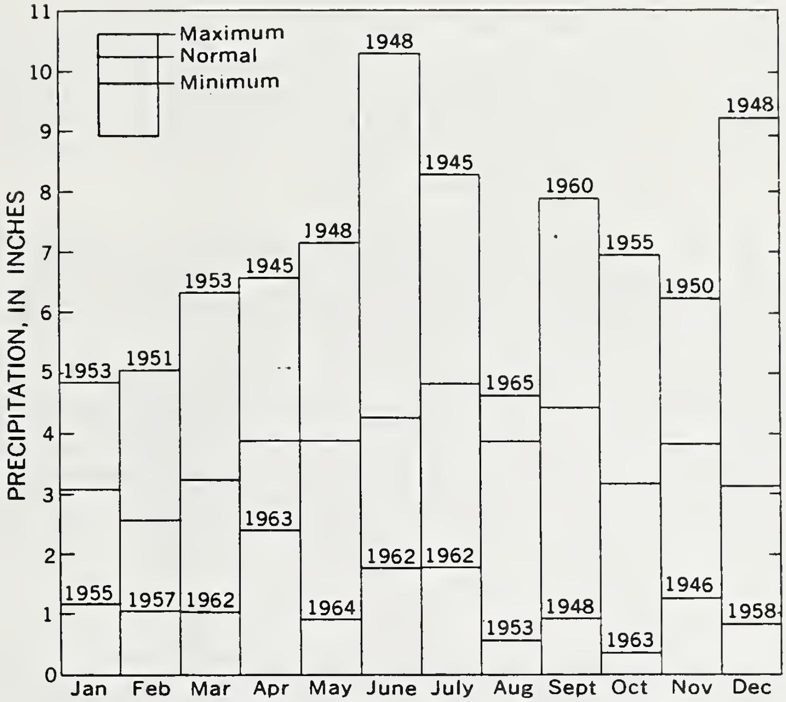


FIGURE 2 — *Graph showing minimum, normal, and maximum precipitation at Pittsfield for the years 1944-65 (normal based on period 1931-60)*

Precipitation information is from Hydrologic Investigations, Atlas HA-281, USDI, U.S. Geological Survey.

The average monthly precipitation varies from a low of 2.5 inches in winter to a high of 4.9 inches in the summer. Much of the winter precipitation falls as snow which averages about 75 inches annually. Continuous snow cover lasts on the average from 2 to 3 months depending upon the elevation.

Flooding occurs most often in spring caused by a combination of rain and melting snow. Severe floods occur, though infrequently, in late summer and fall during the normally low water season. These are caused by heavy rains associated with hurricanes or storms of tropical origin. Localized flooding is sometimes caused by intense summer thunderstorms.

LAND

Topography and Geology

The topography of the Upper Housatonic River Basin is typical of that found in Berkshire County and the Basin can be divided into a three-part physiographic system. The components are the valley of the Housatonic and its major tributaries, the highland area to the east, and the Taconic Range on the west. Elevations range from a high of 2621 feet at Brodie Mountain in Hancock to a low point of approximately 950 feet near the Pittsfield-Lenox boundary. The valley area ranges from 950-1100 feet above sea level. The Taconic Range and the eastern highland area exhibit relief of about 1000 feet above the valley floor.

The physiography of the Basin is a reflection of the erosion resistance of the underlying bedrock. The Housatonic and its major tributaries are underlain by the more easily erodible limestones and dolomites. The Taconic Range consists of schistose and phyllitic rock while the eastern highlands consist of gneisses and schists. These latter rock types are more resistant to erosion and thus stand above the limestone valley.

Overlying the bedrock of the Basin are deposits of the Pleistocene ice sheet which retreated over 7000 years ago. These sand, gravel, and clay deposits range in thickness from less than 10 feet to over 200 feet in some valleys.

Both the surficial deposits and bedrock are important to the communities of the Basin. In past years, both iron ore and limestone were quarried as is evidenced by several ore pits in the Richmond Pond and Pontoosuc Lake watersheds. Sand and gravel deposits are mined today for building materials. Groundwater obtained from sand and gravel deposits provides drinking water for thousands of Basin residents.

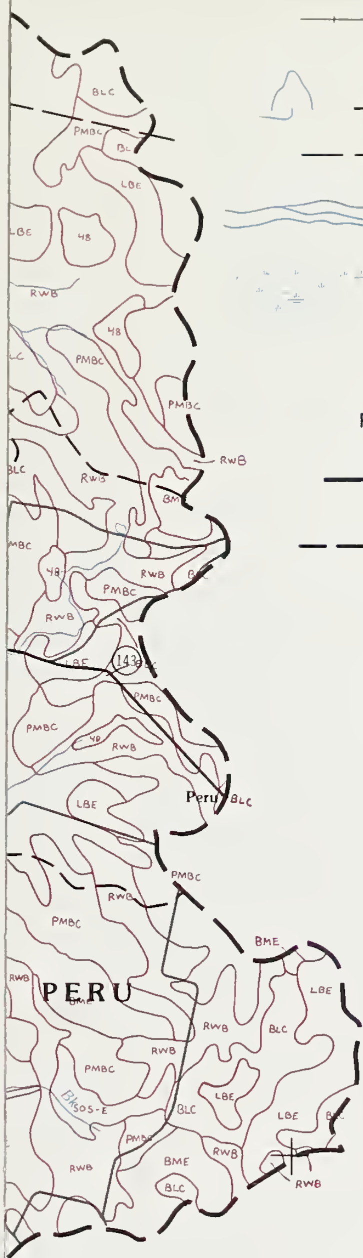
Soils

The soils of the Upper Housatonic River Basin were formed from materials influenced by glaciation. The Basin's hills are covered with from two to three feet of loamy material underlain by firm, loamy or sandy, heterogeneous glacial till. Stones and boulders are normal surface features in wooded areas. Bedrock outcrops are especially common on the steeper slopes.

In the valleys and lower areas of the hills, the soils formed in materials influenced by glacial meltwater. These areas range from nearly level to moderately steep with shorter slope lengths than the nearby upland hills. Soils in these areas are varied but commonly have substrata of sand or sand and gravel.

Near the Housatonic River are soils formed in flood plain sediments. These soils are silt and nearly level.

Figure 3 presents the soils of the river basin. Material to prepare this map was obtained from preliminary field data and is subject to revision.



Railroad single or multiple

Dam

Town boundary

Perennial stream

Marsh

PROJECT MEASURES

Watershed boundary

Sub watershed boundary

540
42°27'30"
530
520
42°25'00"
510
42°22'30"

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL ASSOCIATION MAP

UPPER HOUSATONIC RIVER BASIN
BERKSHIRE COUNTY
MASSACHUSETTS

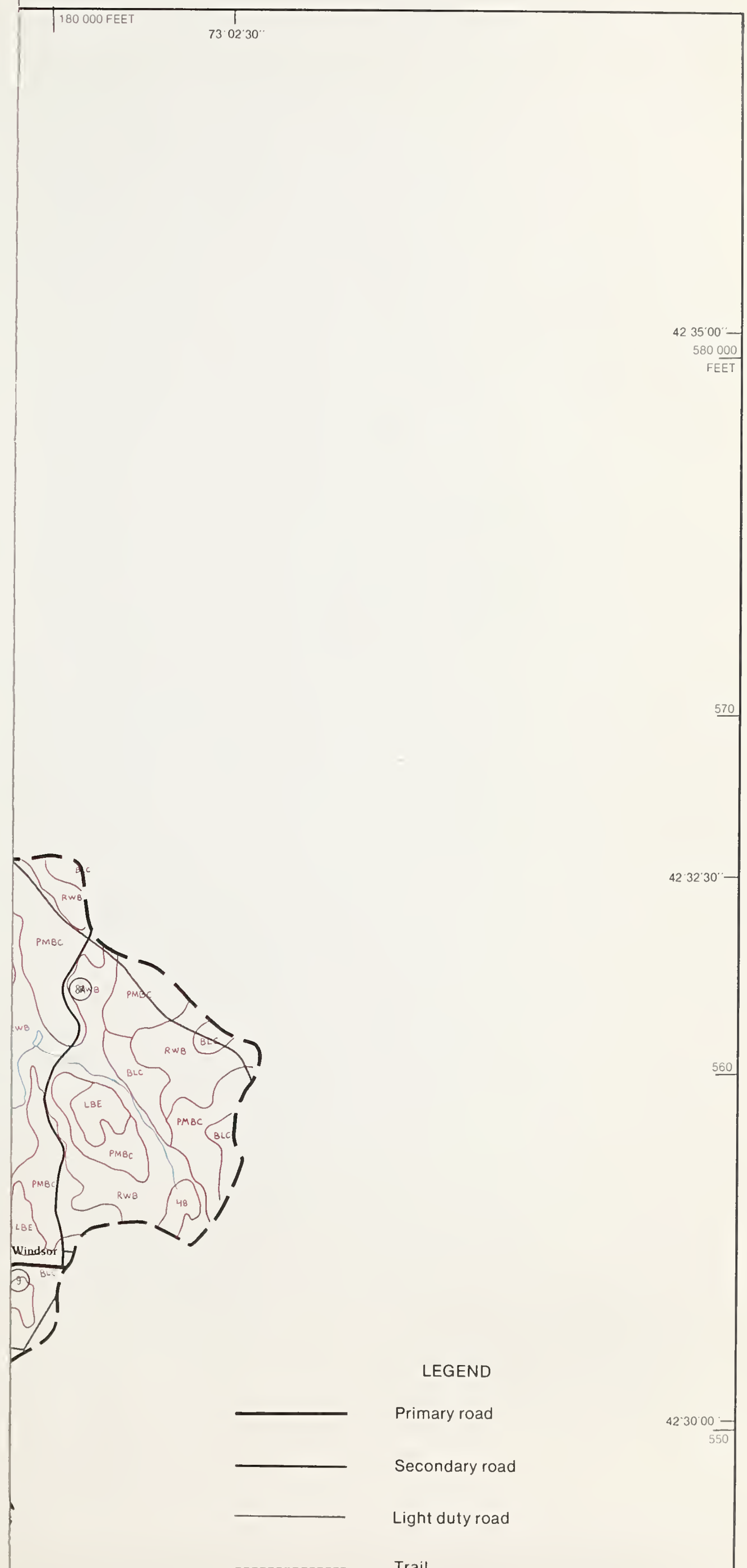
180 73°02'30"

DECEMBER 1980 4-R-37865-2

DECEMBER 1980 BASE 4-R-37865

DECEMBER 1980 BASE 4-R-37866

USDA—SCS—FORT WORTH, TEXAS 1982



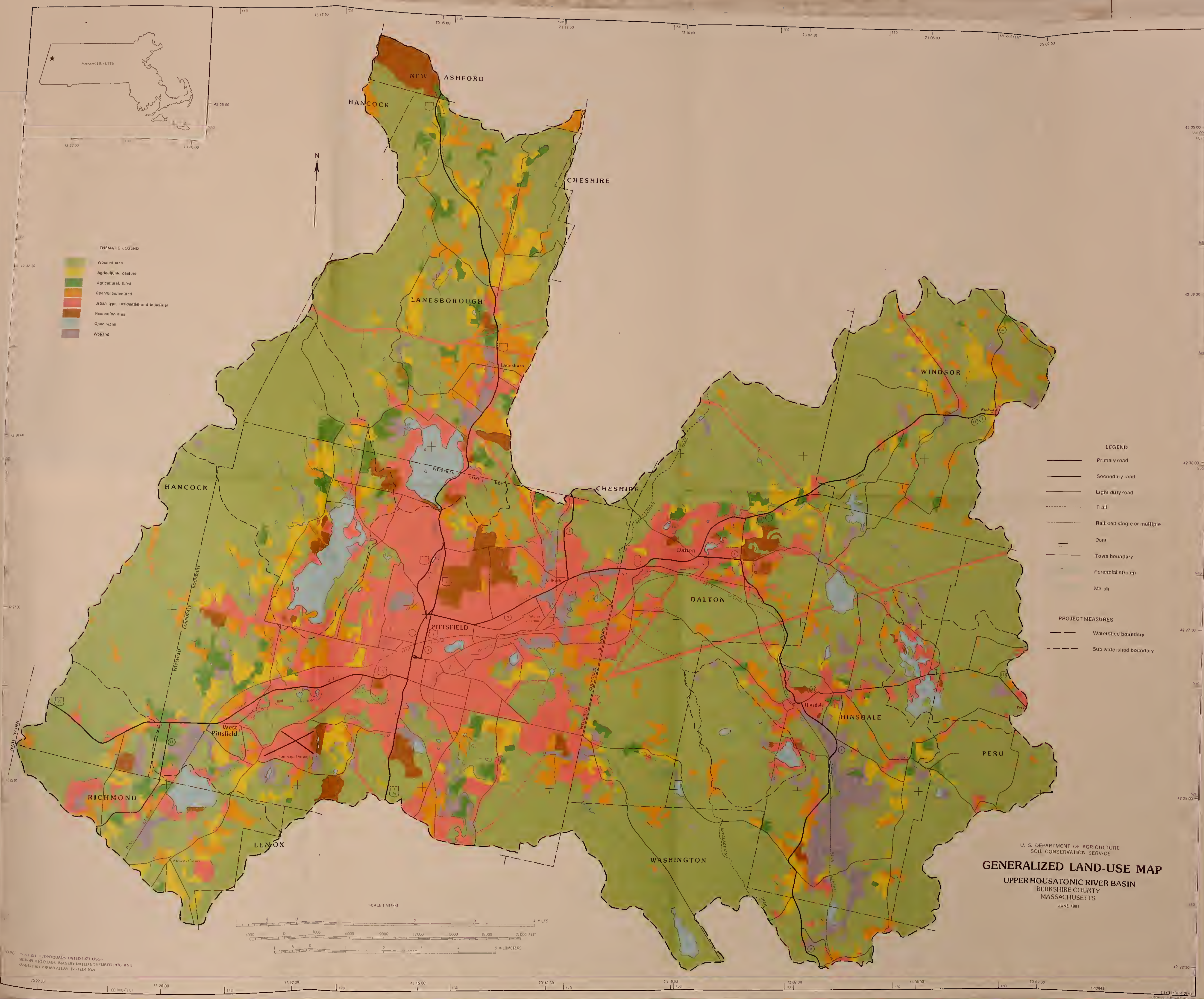
180 000 FEET
73 02'30''
42 35'00''
580 000
FEET
570
42 32'30''
560
42 30'00''
550
BLC
RWB
PMBC
LBE
48
Windsor
LEGEND
Primary road
Secondary road
Light duty road
Trail

Table A-1

Soils of the Upper Housatonic River Basin

- Legend for Map -

35-C	Hinckley-Groton association, 0 to 15 percent slopes, consisting of excessively drained Hinckley and Groton soils and well drained Merrimac and Copake soils.
38-A	Sudbury fine sandy loam, 0 to 3 percent slopes.
40 A	Scarboro-Walpole association, 0 to 3 percent slopes, consisting of very poorly drained Scarboro soils and poorly drained Walpole soil.
44 A	Saco-Limerick association, 0 to 3 percent slopes, consisting of very poorly drained Saco soil and poorly drained Limerick soil.
48	Medisanrists (muck).
52	Urban land.
67A	Windsor loamy fine sand, 0 to 3 percent slopes.
87A	Hadley silt loam.
92A	Winooski silt loam.
138A	Deerfield loamy fine sand, 0 to 3 percent slopes.
139A	Wareham loamy sand.
151C	Quonset gravelly sandy loam, 8 to 15 percent slopes.
151D	Quonset gravelly sandy loam, 8 to 15 percent slopes.
152B	Warwick gravelly loam, 3 to 8 percent slopes.
152C	Warwick-Quonset association, 8 to 15 percent slopes, consisting of well drained Warwick soil and excessively drained Quonset soil.
152D	Warwick gravelly loam, 15 to 25 percent slopes.
424C	Lenox silt loam, 3 to 15 percent slopes, consisting of well drained limestone soils without hardpans.
426D	Stockbridge silt loam, 15 to 25 percent slopes.
427C	Stockbridge stony silt loam, 3 to 15 percent slopes, consisting of well drained limestone soils with hardpans.
427D	Stockbridge stony silt loam, 15 to 25 percent slopes.
430C	Amenia silt loam, 0 to 15 percent slopes, consisting of moderately well drained limestone soils with hardpans.
431B	Amenia very stony silt loam, 3 to 8 percent slopes.
432A	Kendaia-Lyons association, 0 to 3 percent slopes, consisting of poorly drained Kendaia soils and very poorly drained Lyons soils.
432B	Kendaia silt loam, 3 to 8 percent slopes.
432C	Kendaia silt loam, 8 to 15 percent slopes.
441C	Rock outcrop-Pittsfield complex, 3 to 15 percent slopes, consisting of well drained to excessively drained shallow to limestone bedrock soils and well drained deep limestone soils.
441DE	Rock outcrop-Pittsfield complex, 15 to 35 percent slopes, consisting of well drained to excessively drained, shallow to limestone bedrock soils and well drained deep limestone soils on slopes greater than 15 percent.
442B	Pittsfield fine sandy loam, 3 to 8 percent slopes.
444D	Pittsfield very stony fine sandy loam, 15 to 35 percent slopes, consisting of well drained limestone soils without hardpans.
444E	Pittsfield and Nellis very stony soils, 25 to 35 percent slopes.
506A	Oakville loamy sand, 0 to 3 percent slopes.
506B	Oakville loamy sand, 3 to 8 percent slopes.
505E	Groton-Hinckley association, 15 to 35 percent slopes, consisting of excessively drained Hinckley and Groton soils and well drained Merrimack and Copake soils.
512A	Hero fine sandy loam, 0 to 3 percent slopes.
512B	Hero fine sandy loam, 3 to 8 percent slopes.
513A	Fredon fine sandy loam.
514A	Halsey fine sandy loam.
520	Udorthents, smoothed; consisting of soils formed by the cutting or filling of areas in the process of construction.
521	Dumps.
523A	Fredon Variant fine sandy loam, 0 to 3 percent slopes.
BDE	Bernardston-Dutchess association, 15 to 45 percent slopes, of silt loams.
BLC	Tunbridge-Lyman association, 3 to 15 percent slopes.
BME	Berkshire-Marlow association, 15 to 45 percent slopes, of very rocky loam.
NMC	Taconic-Macomber association, 3 to 15 percent slopes.
GP	Gravel pits.
LBE	Lyman-Tunbridge association, 15 to 45 percent slopes.
NDE	Taconic-Macomber association, 15 to 45 percent slopes.
PBDC	Pittstown-Bernardston association, 3 to 15 percent slopes.
PMBC	Peru-Marlow association, 3 to 15 percent slopes.
PWB	Pillsbury-Whitman association, 0 to 8 percent slopes.
SWB	Stissing-Mansfield association, 0 to 8 percent slopes.


MASSACHUSETTS
N
NEW ASHFORD
HANCOCK
CHESHIRE
LANESBOROUGH
Lanesboro
HANCOCK
CHESHIRE
PITTSFIELD
Dalton
DALTON
WINDSOR
HINSDALE
Hinsdale
PERU
West Pittsfield
Municipal Airport
RICHMOND
LENOX
WASHINGTON
NEW YORK
THEMATIC LEGEND
Wooded area
Agricultural, pasture
Agricultural, tilled
Open/uncommitted
Urban type, residential and industrial
Recreation area
Open water
Wetland
LEGEND
Primary road
Secondary road
Light duty road
Trail
Railroad single or multiple
Dam
Town boundary
Perennial stream
Marsh
PROJECT MEASURES
Watershed boundary
Sub watershed boundary
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GENERALIZED LAND-USE MAP
UPPER HOUSATONIC RIVER BASIN
BERKSHIRE COUNTY
MASSACHUSETTS
JUNE 1981
4 MILES
5 KILOMETERS

Flood Plain Land

There are over 33 miles of principal streams and tributaries within the Basin. More than 4000 acres would be flooded during a 1-percent chance flood.

Several flood plain studies have or been are being done in the Upper Housatonic River Basin. In March 1974 a Flood Hazard Analysis for the Upper Housatonic River was completed by the USDA, Soil Conservation Service. More recently, Flood Insurance Studies have been made for those communities with major flood plains. The U.S. Army Corps of Engineers is conducting a 90-town Urban Study of the Housatonic River Basin in Massachusetts and Connecticut. Primary emphasis of that study is water supply and flooding.

Prime Farmland

Prime farmland comprises about 10,100 acres or 11 percent of the Basin area and represents land which serves or could serve an important production function. Prime farmland is land best suited for producing food, feed, forage, and fiber; and also available for these uses (the land could be cropland, pasture land, forest land, and other land, but not urban, built-up land, or water). It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

WATER QUANTITY AND QUALITY

Surface Water

Surface water yields in the study area are high as compared to the entire Housatonic River Basin and average over 1.2 million gallons per day per square mile. The amount of water that runs off depends upon where, when, and how the precipitation falls. Topography, soils, and vegetative cover determine the difference in yield from various sites. However, the amount that runs off from a given precipitation event depends upon the type of precipitation (rain or snow), amount and intensity, and whether the ground is snow covered, dry, saturated, or frozen.

Streamflows are generally lowest in late summer and early fall when rainfall is lowest and evaporation and vegetative water use are at a maximum. The mean monthly discharge varies from a low of about 0.5 cubic feet per second per square mile (csm) in August to a high of 4.5 csm in April.

A review of the records from the Coltsville streamflow gauge, located on the East Branch of the Housatonic River illustrates how streamflows and runoff can vary from the average. For example, the average annual streamflow is 115 cubic feet per second (cfs) but the flow has been as low as 4.4 cfs and as great as 6400 cfs. Also large variations in runoff occur not only from year-to-year but for periods of years. For instance, the average annual runoff from 1936 to 1980 was 27.4 inches, compared to over 32 inches for the 10-year period from 1971 to 1980.

History of Flooding

Within the past century, the Upper Housatonic River Watershed has experienced numerous flood events. The most significant of these occurred in 1927, 1936, 1938, 1948-49, 1969, 1973, and 1980. While parts of Massachusetts experienced a severe flood in August 1955, resulting from Hurricane Diane, the Upper Housatonic River Watershed received only a portion of the record-breaking rainfall experienced by other areas.

The flood of September 1938 and the New Year Flood of 1948-1949 were the most severe and damaging floods to occur within the study area in recent times.

The flood of September 1938 was caused by four days of heavy rainfall climaxed by a hurricane on September 21. Rainfall at Pittsfield was 7.3 inches for this storm and the Coltsville streamgauge recorded 6400 cfs, the maximum recorded to the present date.

Damages and losses resulting from this flood were enormous. The flood claimed 136 lives throughout the state. In Pittsfield, damages were reported to be in excess of $230,000, with over $30,000 for stream channel cleanup and improvement. The residential areas of Lakewood on the east side, and Zoar Avenue in West Pittsfield were severely damaged. Discharges on the Southwest Branch were increased by the failure of two dams and the destruction of five bridges.

The New Year Flood of 1948-49 was the result of a 3-day rain which began on December 29, and deposited amounts ranging from 5 to 12 inches over the study area. For the most part, snow cover was light and had little effect on the magnitude of flood discharges. The streams began to rise on December 30 and reached their peaks on December 31. Secondary peaks occurred on January 6 as a result of additional rainfall. This flood failed to reach the 1936 or 1938 discharges recorded at the Coltsville Station primarily because of the distribution and varying depths of rainfall, the drawndown stage in several reservoirs, and the shallow depth of snow cover.

The New Year Flood was the most costly, the study area has experienced to date. In Pittsfield, municipal damages were about $110,000 which included roads, bridges, pipelines, etc. Municipal damages in Dalton, Hinsdale, and Lanesborough totaled nearly $25,000. Substantial damage was incurred by industries in Pittsfield and Dalton, with some industries reporting three feet of water inside the plant. Dollar totals for residential damage and work-loss are not readily available, but were staggering.

Damage also included the erosion and subsequent deposition of soil, the debris left by receding waters, and the alteration of stream courses. The state spent about $2 million on a program to clean up the stream channels in the flooded areas following this storm.

Forest Management on Water Supply Watersheds

The U.S. Forest Service, with assistance from the Massachusetts Division of Forests and Parks, conducted inventories and evaluations of municipal water supply watersheds to determine the effectiveness of forestry practices applied as part of watershed management plans. These practices can have an impact on regulating the quality, quantity, and timing of water yields. They are accomplished by timber harvests, control and size of forest openings, and changing species composition or vegetation type.

The reservoir watersheds evaluated are indicated in Table A-2.

Table A-2

Reservoir Watersheds Evaluated for Forest Managment

Reservoir Name	Municipality Served	Watershed Acreage
Ashley Lake	Pittsfield	430
Belmont Res.	Hinsdale	260
Cleveland Brook Res.	Pittsfield	950
Little Egypt and Egypt Res.	Dalton	720
Fernwood Res.	Hinsdale 1/	570
Hathaway Res.	Pittsfield	610
Onota	Pittsfield 2/	6660
Upper and Lower Ashley Res.	Pittsfield	1240
Upper and Lower Sackett Res.	Pittsfield	620
Windsor Res.	Dalton	9390

1/ Owned by Hinsdale, but not used for water supply.
2/ Used for emergency water supply.

Pittsfield and Dalton have had forest management plans developed for two areas. Pittsfield has adopted a management plan for their 5,500 acre watershed property located southeast of the city in Washington, Dalton, and Hinsdale. The Dalton Fire District Watershed forest totals 2050 acres, located in the towns of Hinsdale, Windsor, and Peru.

The utmost concern stated by both management plans is an increase in water quantity, and protection and improvement of water quality. Management of high quality timber is also addressed. Harvesting of forest products to increase water quantity and provide an economic return to the towns is the major goal of the plans. Various silvicultural techniques to increase timber quality and remove overmature timber are covered. Concern is given to proper road layout, stream crossings, and limiting time of year when logging operations may take place. Aesthetic management through proper silviculture in high visibility areas is also addressed by both plans.

The extensive forest land in the Basin provides the opportunity to protect the water supply sources and the reservoirs. In an area so dependent upon surface water supplies, careless logging practices in the watersheds can contribute to water quality problems.

The exposure of mineral soil provides an optimal condition for the soil to erode. The vegetative growth potential is reduced on an eroded area and soil washed from such areas causes siltation that can affect aquatic life and reduce storage capacity in water bodies. On forest land, if erosion occurs from a management activity, it is usually from the road network constructed to move logs from the tree felling site to a public access road. Wildfires which burn through the surface organic layers to expose mineral soil can also lead to erosion.

A properly planned, constructed, and maintained logging road network causes little damage on-site in loss of growth potential or off-site in degradation of water quality. Good roads can be used after logging for access to control

fire, insect, and disease outbreaks. In most instances, roads that are properly designed and constructed will heal by regrowth of vegetation after one or two growing seasons, provided that the road is not driven on repeatedly after the logging job is complete.

Eleven areas that had been recently logged (1977-1979) were checked to determine if the log transport network was eroding and causing sedimention. On the sites examined, eight showed no evidence that soil erosion was creating a sediment problem. Three showed evidence that could be considered as potential problems.

On the three sites, the roadways were eroding and sediment could reach nearby water bodies. Two of the three sites showed evidence of revegetation. One site did not appear to be revegetating and could continue eroding until all the erodible material was removed to bedrock. The concern on this site was a skid road constructed on a steep slope, with no provision made for proper drainage off the road. The skid road on this site acted as a stream channel. The drainage problem could have been prevented if the road had been properly located and built. The situation could have been improved by breaking the long, steep slope with dips or water bars, thereby allowing the water to run off at intervals for absorption on the forest floor. On those logging roads that show evidence of continuing erosion, corrective measures such as grading, draining, and planting grass may have to be taken.

From the viewpoints of cost, resource productivity, and water quality, preventing soil erosion on logging roads through proper design and construction is more desirable than rehabilitation.

Water-based Recreation

The lakes in the Basin provide various recreational opportunities. Fishing, swimming, motor boating, and canoeing/sailing are the most popular. The five major lakes are rated "B" for water quality by Massachusetts Division of Water Pollution Control. This means that they are acceptable for contact water recreation. The Massachusetts Statewide Comprehensive Outdoor Recreation Plan shows a shortage of facilities for these activities but none were classified as "critical facility need." For the most part, the five major study area lakes have facilities for these activities according to their size. For example, Onota Lake, the largest lake has the longest beach area, 2770 linear feet and most facilities for boating and fishing.

Fishing pressure is high on most of the lakes. Onota Lake is by far the most heavily fished

POPULATION

The four principal Basin communities; Pittsfield, Dalton, Hinsdale, and Lanesborough account for approximately 95 percent of the Basin's population. Current population figures and projections through the year 2000 are presented in Table A-3.

Table A-3

Population Data and Projections

	1980	1985	1990	1995	2000	1980-2000 % Change
Dalton	6,798	6,700	6,840	7,000	7,050	3.71
Hinsdale	1,702	1,760	1,870	2,000	2,070	21.62
Lanesborough	3,110	3,260	3,400	3,570	3,630	16.72
Pittsfield	51,942	51,000	50,550	50,100	49,650	-4.41
Total	63,552	62,720	62,660	62,670	62,400	-1.81

(Source: Berkshire County Regional Planning Commission)

The figures show the dominance of Pittsfield. The rather significant population increases projected for Hinsdale and Lanesborough are erased in the total by the projected decline in Pittsfield.

USE OF RESOURCE BASE

Land Use

A generalized land use map for the Basin was prepared and is presented in Figure A-5. The land use map was prepared by Soil Conservation Service personnel at the Pittsfield field office with the assistance of citizen volunteers in the towns of Hinsdale and Lanesborogh.

Land use maps prepared by William P. MacConnell et al., of the Department of Forestry and Wildlife Management at the University of Massachusetts, served as the basic data source for the inventory and update. Information on the MacConnell "Mapdown" series was supplemented by U.S. Geological Survey topographic quads for the region and aerial photos. The aerial photos were particularly useful in mapping those areas with limited accessibility.

Industrial Influence

Although Berkshire County is primarily rural, the Upper Housatonic Basin is industrialized especially in and around Pittsfield. In 1970 manufacturing accounted for 45 percent of total employment. Electrical products are the major goods produced. Indications are that the economy will change little in the next 20 years. Some decreases in manufacturing are likely as other sectors such as services and trade grow slightly.

Multiple Use Forestry Production

Forest land occupies approximately 76,000 acres in the Basin. The species makeup of the forest is diverse and is part of the northern hardwood forest. Major softwood species are white pine and hemlock. Spruce and balsam fir are common components on the eastern fringe of the Basin area. The oaks, primarily red oak, and maples predominate the hardwood species. Other common hardwood components are birches, beech, ash, aspen, and cherry.

Approximately 47,000 acres of forest land are in private ownership. Included in this acreage are quasi-public lands belonging to the Massachusetts Audubon Society, F.G. Crane, Sr. Conservation Trust, and the Shaker Reservation. The state owns approximately 19,000 acres, located principally in Washington, Hancock, Lanesborough, and Pittsfield. Municipal holdings approximate 10,000 acres, with major municipal holdings in Washington and Hinsdale.

The forest resource provides many goods and services: timber products, wildlife, water, recreation, visual amenities are among them. Forests have the inherent capacity to produce such benefits, singly or in combinations. The level and mix of outputs are decision elements in the owner's management plan. Service foresters with the Department of Environmental Management are available to help landowners in the development of forest management plans.

The resource management objectives of forest landowners vary widely. The private landowner typically owns a small tract which is managed for both monetary and non-monetary objectives. Aesthetics, recreation, investment, and timber production are among the reasons for owning forest land. Those who harvest timber, harvest periodically and often at long intervals of time. The major exceptions are those who cut timber for fuelwood. The timing and intensity of cutting may depend more heavily on current market conditions and personal circumstances of the owner rather than on long-term production goals. Planning horizons are typically short.

Managers of public and quasi-public forest land have to consider the benefits from the forest in both monetary and non-monetary terms. These benefits might involve a desire to help maintain a level of employment in a forest area, to provide recreation opportunities, to protect the watershed of surface water supplies, to provide a monetary return to offset costs of management, or to protect ecological or historical areas. The utmost concern of managers of municipal holdings on watersheds having surface water supplies is protection and improvement of water quality.

Of the 47,000 private forest land acres in the Basin, an estimated 20,000 acres have had some degree of management assistance. Most requests for assistance from public foresters are from landowners in the towns of Lanesborough and Dalton. Pittsfield landowners are increasing their requests. Many of the requests are due to recent changes in the Massachusetts Forest Tax Law (Chapter 61) whereby landowners that qualify can have their forest land listed as "Classified Forest Land" and obtain a tax abatement.

Two mills that process roundwood to products are located within the Basin. These mills primarily use hardwood logs and draw their wood from within and without the Basin boundaries. One mill produces firewood and pallets, while the other produces grade lumber and pallet stock. The latter is a large producer having an extensive market range.

Sawlogs destined for sawmills are the major product cut in the Basin. Red oak, white ash, hard and soft maples make up a large portion of the species cut. A number of other species are also cut. Fuelwood is another large use from the Basin's forest land. Hardwoods are preferred, particularly the oaks, ash, and cherry, but nearly all hardwoods are cut for fuelwood. Pulpwood is usually a relatively minor use, distance from markets being a major detriment. Miscellaneous products such as poles and pilings are occasionally cut when a market develops.

The volume of timber cut annually within the Basin varies depending upon factors such as market conditions and the landowner's particular circumstances. The market for softwoods is slack at this time, reflective of the national demand for softwood lumber. In state fiscal year 1980, 20 permits for cutting were issued involving 837 acres. About 1,200,000 board feet of sawlogs, mostly red oak, and 5,800 cords were cut. This particular year, much of the cordage was spruce pulp. The cut of additional unreported volumes for fuelwood would probably raise the total to 10,000 cords. Similarly, the cut for sawlogs may approach 1,300,000 board feet.

Upland Wildlife

Upland forest land comprises the largest land use area of the Upper Housatonic River Basin. As much as 70 percent of the basin is covered by upland forests. The large amount of forest land is conducive to the development of a large diversity of upland widlife species. A brief listing of some of the more common species one might expect to find contained within the region is shown in Table A-4.

Table A-4

Upland Wildlife

Mammals	Birds	Reptiles, Amphibians
white-tail deer	ruffed grouse	northern black racer
deer mouse	hairy woodpecker	eastern milk snake
woodland jumping mouse	scarlet tanager	American toad
eastern chipmunk	slate colored junco	common newt
white foot mouse	black-capped chickadee	spotted salamander
grey squirrel	pileated woodpecker	
starnose mole	blue jay	
shorttail shrew	screech owl	
grey fox	common crow	
red squirrel	starling	
porcupine	red tail hawk	
striped skunk		

Fishery

The Massachusetts Division of Fisheries and Wildlife prepared the following species specific evaluation of the fisheries of the Basin. This fish survey included the major lakes of the Basin and their tributary and outlet streams.

The Wetlands Inventory and Evaluation - Appendix B, rated specific wetland sites within the Basin as to feasibility as a warm water fish habitat.

All fish stocking indicated in the following fishery survey is performed by the Massachusetts Division of Fisheries and Wildlife, except as noted.

Richmond Pond is stocked annually with about 3,000 trout. Rainbow trout are the primary fish stocked, but brook and brown trout are also released.

A 1981 fish survey found the following species: largemouth bass, chain pickerel, yellow perch, golden shiner, pumpkinseed, bluegill, rock bass, black crappie, white sucker, and brown bullhead. Previously unknown to this pond but taken during the fish survey were several smallmouth bass and walleye pike.

The Southwest Branch of the Housatonic River begins at the outlet of Richmond Pond. A portion of the stream supports the greatest amount in pounds of trout per surface acre (approximately 40 pounds) of any stream in the Upper Housatonic drainage. The most productive reach for trout is the reach beginning at Jacoby Brook and extending downstream to Barker Road. The Southwest Branch is also stocked annually with trout. The Southwest Branch supports a naturally reproducing population of brown trout.

There are several tributary streams that flow into the Southwest Branch of the Housatonic River. Most of these streams have native populations of brook trout and naturalized populations of brown trout. Jacoby Brook and May Brook are the more significant of these smaller trout streams.

Onota Lake is the largest body of water in the Massachusetts portion of the Housatonic drainage. Onota has one of the most diversified fish populations of any lake in the Commonwealth. Among the fish harvested from Onota are largemouth bass, chain pickerel, northern pike, white catfish, channel catfish, brown bullhead, yellow perch, black crappie, pumpkinseed, bluegill, and rainbow smelt.

About 17,000 trout, comprised mostly of rainbow trout but also including brook and brown trout are stocked annually in Onota.

There are four brooks flowing into Onota Lake. Parker Brook provides spawning habitat for rainbow smelt, brook trout, and brown trout. Daniel Brook is a tributary that is stocked annually with trout.

The outlet of Onota Lake flows into the West Branch of the Housatonic River. Although this stream supports a variety of fish species, industrial and domestic pollutants that have been introduced over the years have adversely affected the fishery. Very little sport fishing occurs in this stream.

Silver Lake is an enlarged great pond located near the center of Pittsfield. Industrial pollution from local industries has eliminated most fish life from this pond. The sources of contamination are being eliminated and it is hopeful that the pond will recover sufficiently to support fish life. Concerns about PCB contamination need to be addressed before the lake could be used as a recreational fishing resource.

Pontoosuc Lake provides substantial water-based recreation. The fishery provides some excellent yellow perch fishing. Other species present in the lake are largemouth bass, brown bullhead, yellow bullhead, bluegill, and pumpkinseed.

The Massachusetts Division of Fisheries and Wildlife annually stocks about 1,500 trout in Pontoosuc Lake. Shallow depth and high summer water temperature limit the potential of this reservoir for trout. In the fall of 1980 and in the summer of 1981, the Division released tiger muskie in Pontoosuc Lake. The tiger muskie is a hybrid developed by crossing a northern pike

and a muskellunge. This sterile hybrid is a fast growing predator and hopefully will reduce and improve the population of pan fishes and other fishes upon which it will prey.

Ashmere Lake supports largemouth bass, smallmouth bass, white perch, yellow perch, chain pickerel, pumpkinseed, and brown bullhead.

Shallow depth and high summer water temperature limits the lake's potential for trout and consequently the trout are not stocked.

The dam and about 75 percent of the shoreline are owned by the Massachusetts Department of Environmental Management, Division of Forests and Parks. Public access for future use of Ashmere Lake is secure.

Plunkett Reservoir supports largemouth bass, yellow perch, bluegill, and other panfish.

The Massachusetts Division of Fisheries and Wildlife stocks about 500 trout in Plunkett each year. Shallow depth and high summer temperature limit the potential of this reservoir for trout.

Plunkett Reservoir drains into the East Branch of the Housatonic River which is stocked annually with brook and rainbow trout. A naturally reproducing brown trout population is also present in this stream. All of the cold water streams draining into the East Branch have native populations of brook trout.

Trout Streams of the Upper Housatonic Drainage support native populations of brook trout. These streams include: Bennett Brook and Cady Brook (Hinsdale); Cove Brook (Richmond); Cleveland and Wahconah Falls Brook (Dalton); Secum Brook (Lanesborough); and Smith, Daniels, Sackett and Jacoby Brooks (Pittsfield).

Many of the streams in the drainage also support naturalized populations of brown trout, these streams include: Cove Brook (Richmond); Mount Lebanon Brook and Bennett Brook (Hinsdale); Southwest Branch of the Housatonic River (Pittsfield); Town Brook and Secum Brook (Lanesborough); Smith, Daniels, Sackett and Jacoby Brooks (Pittsfield); and Cleveland and Wahconah Falls Brook (Dalton).

Town Brook in Lanesborough, is one of the few streams in the Commonwealth where naturally reproducing rainbow trout are found.

Cultural and Historical Sites

Crane Paper Museum in Dalton records the history of Crane & Co., which has been making paper in Dalton since 1801.

Berkshire Museum in Pittsfield is a museum of art, science, and history. In addition to its permanent displays, the museum has a very active program of changing exhibitions as well as lectures, motion pictures, classes, clubs, field trips, musical programs, and other events. Permanent exhibits include paintings by Van Dyck, Reynolds, and many others, as well as an especially strong collection of American paintings of the "Hudson River School." The classical Gallery contains both original works and casts of Greek and Roman sculpture. In the Egyptian Room are the mummy of a king and many other exhibits from the early cultures of Egypt, Babylonia, and the near East. The Hall of Man houses one of the sledges with which Peary reached the North Pole.

Arrowhead in Pittsfield was the home of Herman Melville, where he wrote Moby Dick in 1850. It is now the headquarters of the Berkshire County Historical Society, which is restoring it to its original condition, including restoration of the famous piazza.

South Mountain Music Colony in Pittsfield holds summer concerts of chamber music.

Shaker Village in Hancock is a village museum of the Shaker sect. Founded in 1774 by Mother Ann Lee, the Shakers were a religious order based on community property, celibacy, and simplicity. By 1840 their name became synonymous with excellence in industries, crafts, and agriculture. Dedicated to preserving the Shaker Heritage, the Hancock Village maintains 20 restored buildings, working craft and industry shops, a book shop, and shops selling handmade Shaker items.

APPENDIX B

WETLAND INVENTORY AND EVALUATION

APPENDIX B

WETLAND INVENTORY AND EVALUATION

This appendix presents the results of a study to inventory and evaluate the wetlands of the Upper Housatonic River Basin.

The major objectives of the study were:

1. to identify the type, size, and location of wetlands within the Basin towns, and

2. to evaluate the existing and potential functions and values of these wetlands.

Wetlands were identified through use of the Massachusetts Mapdown Cover and Land Use Maps and these data transferred to topogragphic maps. In addition, poorly drained and very poorly drained soils (often a good indicator of wetland areas) were identified on soil map field sheets and also transferred to the topographic maps.

Each wetland area thus identified and mapped was visited and was classified as to vegetative composition and was evaluated as to its significance for fish and wildlife habitat, boating, shoreline fishing, nature study, waterfowl hunting, uniqueness, and visual quality using a procedure developed by the Soil Conservation Service. A summary of the evaluation results is presented in Table B-1.

Wetland System No.	Wetland Location or Name (Acres)	Warm Water Fish Habitat	Wetland Wildlife Habitat	Boat-ing	Shoreline Fishing	Nature Study	Waterfowl Hunting	Unique-ness	Visual Quality	Fl[illegible] Co[illegible]
Dalton										
D-4	Anthony Rd. Appalachian Trail (7)	Medium	Medium	Low	Medium	High	Low	High	Medium	Lo[illegible]
D-6	Main St. & South St. (5)	Low	Low	Low	Medium	Medium	Low	Low	Medium	Me[illegible]
D-8	Center Pond (60)	High	High	Medium	High	High	Low	High	High	Hi[illegible]
D-9	Old Windsor Rd. (3)	N.A.	Low	N.A.	N.A.	Medium	Low	Low	Medium	Lo[illegible]
D-10	Main St. (26)	N.A.	Low	N.A.	N.A.	Medium	Low	High	Low	Me[illegible]
D-11	Appalachian Trail-Off of Grange Hall Rd. (23)	Low	Medium	N.A.	N.A.	High	Low	High	Medium	Lo[illegible]
D-12	Washington & Kirchner Rd. (37)	Low	Medium	N.A.	N.A.	High	Low	High	Medium	Me[illegible]
Hancock										
H-2	Rt. 20 (4)	N.A.	Medium	N.A.	N.A.	Medium	Low	Low	Medium	Lo[illegible]
H-3	Richmond Rd. Berkshire Downs (42)	N.A.	Medium	N.A.	N.A.	High	Low	High	Medium	Me[illegible]
Hinsdale										
1.	Windsor Reservoir (27)	Medium	High	Low	Low	High	Low	High	Medium	
2.	Cleveland Brook (7)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Low
3.	Frank Schnopps Rd. bet. Stone House & Old Windsor Rd. (16.5)	Low	High	Low	Low	High	Low	High	Medium	Low
4.	Frank Schnopps Rd. bet. Stone House & New Windsor Road (9)	Low	Medium	Low	Low	Medium	Low	High	Medium	
5.	Cady Brook Tributary (39)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Low
6.	Cady Brook (New Windsor Rd.) (16.5)	Medium	High	Low	Medium	Medium	Low	Low	Medium	Low
7.	Eberhard Farm (7.5)	Low	Medium	Low	Low	Medium	Low	High	Low	Low-[illegible]
8.	Watson Road (13)	Medium	High	Medium	Medium	Medium	Medium	High	Medium	Medi[illegible]
9.	New Windsor Rd. & Stone House Rd. (40)	Low	Medium	Low	Low	Medium	Low	Low	Medium	
10.	New Windsor Rd. (44.5)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Medi[illegible]
11.	Ashmere Lake Wetlands (295)	High	Medium	High	High	Medium	Medium	High	High	
12.	New Windsor Rd. & Rte. 143 (5)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Medi[illegible]
13.	Rte. 143 - Town Bog (8)	Low	Medium	Low	Low	High	Low	High	Medium	*
14.	Hinsdale Flats (985)	Medium	High	High	High	High	Medium	High	High	High
15.	Camp Romaca (8)	Medium	Medium	Low	Low	Medium	Low	Low	Medium	Low
16.	Russo Brook (43)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Low
17.	Rte. 8 - south of Michaels Rd. (5)	Low	Medium	Low	Low	Medium	Low	Low	Medium	*
18.	Tracy Brook (31.5)	Low	High	Low	Medium	High	Low	High	Medium	Low
19.	Bullards Crossing Bog (4)	Low	Medium	Low	Low	Medium	Low	High	Medium	*

WETLANDS EVALUATION SUMMARY

Wetland System No.	Wetland Location or Name (Acres)	Warm Water Fish Habitat	Wetland Wildlife Habitat	Boating	Shoreline Fishing	Nature Study	Waterfowl Hunting	Uniqueness	Visual Quality	Flood Control
Lanesboro										
1.	Route 7 - Lanesboro-New Ashford Town Line (10)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Low
2.	West of Bailey Road (2)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Low
3.	West of Bailey Road (16)	Medium	High	Low	Medium	Medium	Low	Low	Medium	Low
4.	North Main St. & Quarry Road (3)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Medium
5.	Secum Brook - South of Silver St. (43)	Medium	High	Low	Medium	High	Low	Low	Medium	Medium
6.	Secum Brook - Old Ore Bed Road (56)	Medium	Medium	Low	Medium	Medium	Low	High	Medium	Low
7.	Hollow Brook (8)	Low	Medium	Low	Medium	High	Low	High	Medium	Low
8.	Balance Rock Road (98)	Medium	High	Low	Medium	High	Low	High	High	High
9.	Town Brook (105)	Medium	High	Medium	High	High	Low	High	High	Medium-High
10.	Pontoosuc Gardens (3)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Low
11.	Partridge Road - Lanesboro-Pittsfield Town Line (5)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Low
12.	Gulf Road (22)	Medium	High	Medium	Medium	Medium	Low	Low	Medium	Low-Medium
13.	Berkshire Pond (41)	High	Medium	Low	Medium	High	Low	High	High	Medium-High
14.	Muddy Brook (108)	Medium	Medium	Low	Low	Medium	Low	Low	Medium	Medium
15.	Cheshire Reservoir (73)	Medium	High	Medium	Medium	Medium	Medium	High	Medium	Medium
16.	Camp Mohawk (8)	Medium	High	Low	Low	Medium	Low	Low	Low	Medium
Peru										
PE-1	Tracy Pond Middlefield Rd. (42)	High	High	Medium	High	High	Medium	High	Medium	Medium
PE-4	Rt. 143 (32)	N.A.	Medium	N.A.	N.A.	Medium	Low	Low	Medium	Medium-High
PE-5	East Windsor Rd. (24)	Low	Medium	Low	Low	Medium	Low	Low	Medium	Low
PE-6	Smith Rd. (93)	N.A.	Medium	N.A.	N.A.	Medium	Low	Low	Medium	Medium
Richmond										
R-1	Dublin Rd. & Peak Rd. (16)	N.A.	Medium	N.A.	N.A.	Medium	Low	Low	Medium	Low
R-2	Richmond Pond (460)	High	High	High	High	High	High	High	High	High
R-3	Summit Rd. (20)	Medium	Medium	Medium	Medium	Medium	Low	Low	Medium	Medium
R-4	Pittsfield Rd. (14)	Medium	High	Low	Low	Medium	Low	Low	High	Medium

WETLANDS EVALUATION SUMMARY

Wetland System No.	Wetland Location or Name (Acres)	Dominant Wetland Type(s)	Warm Water Fish Habitat	Wetland Wildlife Habitat	Boating	Shore-line Fishing	Nature Study	Water-fowl Hunting	Uniqueness	Visual Quality	Flo Con
Pittsfield											
P-1	Cascade St. & Churchill Rd. (15)	SS	Medium	High	Low	Medium	Medium	Low	Low	Medium	Med
P-2	Cascade St. (22)	WS	Medium	Medium	Low	Medium	High	Low	High	Medium	Med
P-3	Churchill St. (11)	SS	Low	Medium	N.A.	Low	Medium	Low	Low	Medium	Lo
P-4	Onota Lake (657)	OW,SS, DM	High	Medium	Medium	High	High	Low	High	High	Hi
P-5	Peck's Pond (14)	SS,OW	Medium	Medium	Low	Medium	High	Low	High	Medium	Me
P-6	Waconah Park (29)	SM	Medium	Medium	Medium	High	High	Low	High	Medium	Me
P-8	Churchill & West St. (31)	WS	Medium	Medium	Low	Low	High	Low	High	Medium	Lo
P-9	Berkshire Comm. College (77)	SS,WM	Medium	High	Low	Medium	High	Low	High	Medium	Me
P-11	Gale & Fort Hill Rd. (10)	SS	Low	Medium	Low	Low	Medium	Low	High	Medium	Me
P-12	Maloy Brook & Penn Central RR (28)	SM	Low	High	Low	Low	High	Low	High	Medium	Me
P-14	Rt. 20 & Penn Central RR (86)	SS,SM WS	Medium	High	Low	Medium	High	Low	High	Medium	Me
P-15	Rt. 41 (5)	SS	N.A.	Low	N.A.	N.A.	Medium	Low	Low	Medium	Lo
P-16	Anelsco - Rt. 41 (4)	SS	Low	Medium	Low	Medium	Medium	Low	High	Medium	Low
P-17	Wahconah St. (5)	OW	Medium	Low	N.A.	Medium	Medium	Low	Low	Medium	High
P-18	Mud Pond - Tamarack Rd. (90)	WS,DM	High	High	Low	Medium	High	Medium	High	High	Medi
P-19	Wild Acres (62)	DM,WS	High	High	Medium	High	High	Low	High	High	Medi
P-22	Tamarack Rd. (85)	WS,SS	Low	High	Low	Low	High	Low	High	Medium	Medi
P-23	SW Branch of Housatonic (30)	SS,WS	Medium	Medium	Medium	Medium	High	Low	High	Medium	Medi
P-24	Pittsfield Country Club (45)	OW,WS	High	High	Medium	Medium	High	Low	High	Medium	Medi
P-25	Rt. 7-Pittsfield-Lenox Line (32)	WS	Low	Medium	N.A.	N.A.	Medium	Low	Low	Medium	Low
P-26	Rt. 7-Pittsfield-Lenox Line (23)	WS	N.A.	Medium	N.A.	N.A.	Medium	Low	Low	Medium	Medi
P-28	Pontoosuc School Rt. 7 (8)	SF	N.A.	Medium	N.A.	N.A.	High	Low	High	Medium	Medi
P-32	Unkamet Brook (127)	WS,SS	Medium	Medium	Low	Medium	Medium	Low	High	Medium	High
P-33	East Branch of Housatonic-No. of East St. (73)	SF	Medium	Medium	High	Medium	Medium	Low	Medium	Medium	Medi
P-34	Brattle Brook-bet. East & Elm St. (453)	WS,SF	Medium	Medium	Medium	Medium	High	High	High	Medium	Medium
P-35	Goodrich Pond (67)	WS,OW	Medium	Medium	Medium	Medium	High	Low	High	Medium	Medium
P-36	Housatonic River-So. of Holmes Rd. (184)	SF,WS	Medium	High	High	Medium	High	Low	High	Medium	Medium

WETLANDS EVALUATION SUMMARY

Wetland System No.	Wetland Location or Name (Acres)	Warm Water Fish Habitat	Wetland Wildlife Habitat	Boating	Shoreline Fishing	Nature Study	Waterfowl Hunting	Uniqueness	Visual Quality	Flood Control
Windsor										
W-4	Flintstone Rd. & Tyler Brook (125)	Medium	High	N.A.	Medium	High	Low	Low	Medium	High
W-5	Main Dalton Rd. & Route 9 (23)	Medium	Medium	N.A.	Medium	High	Low	High	Medium	Low-Medium
W-6	Bosma Rd.-Gene Moran Wildlife Mgt. Area (188)	Medium	High	N.A.	Medium	High	Low	High	Medium	Medium
W-7	Savoy Rd. (40)	N.A.	Medium	N.A.	N.A.	Medium	Low	Low	Medium	High
W-9	North St. (42)	N.A.	Medium	N.A.	N.A.	Medium	Low	Low	Medium	Low-Medium
W-10	Tyler Brook (19)	N.A.	Medium	N.A.	Low	Medium	Low	Low	Medium	Low
W-11	Tyler Brook & North St. (22)	N.A.	Medium	Low	Low	Medium	Low	Low	Medium	Low
Washington										
WA-2	Pittsfield Rd. Pittsfield Watershed Area (42)	Medium	Medium	Low	Low	Medium	Low	Low	High	Low-Medium
WA-3	Valley Rd.-Muddy Pond (108)	High	High	Medium	High	High	High	High	High	Low-Medium

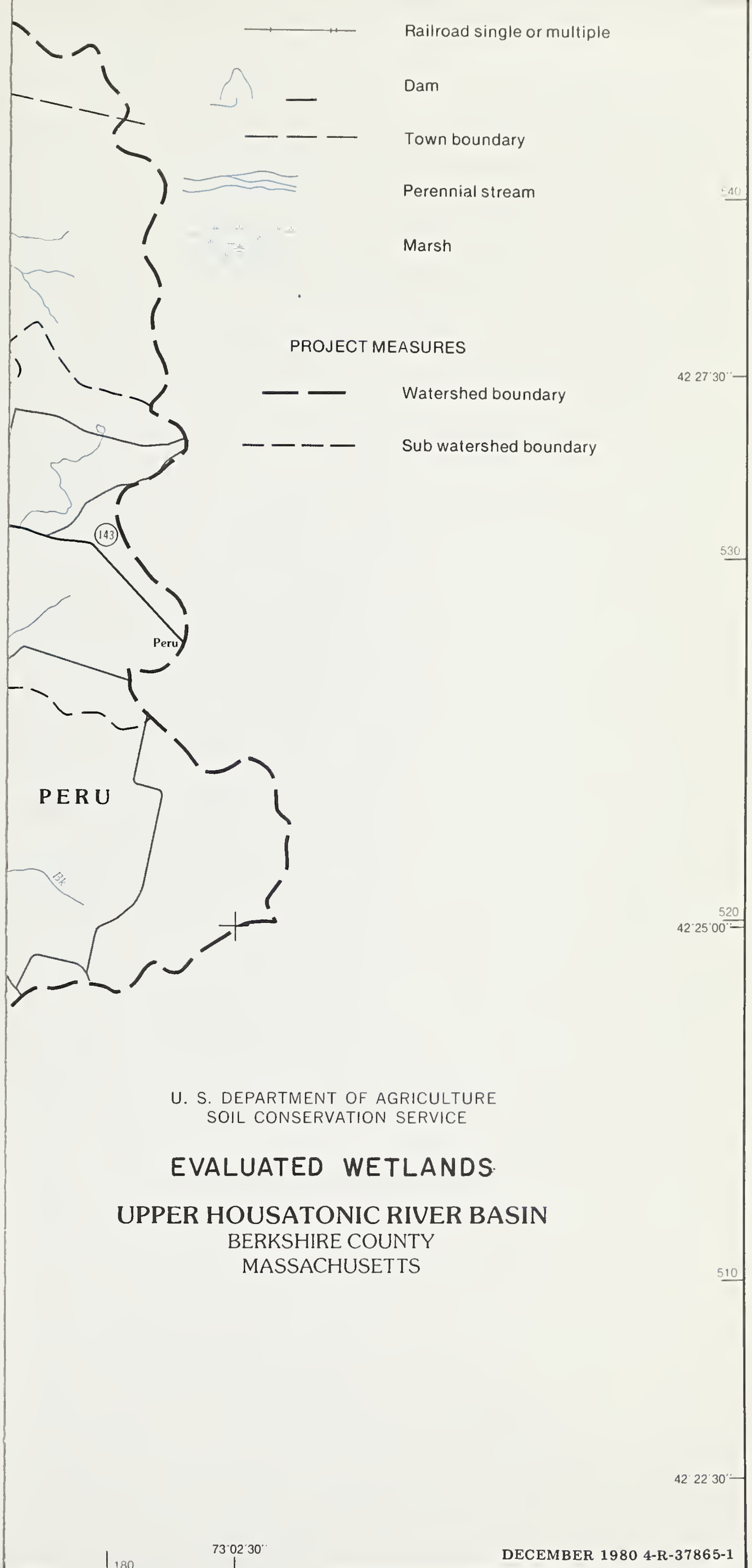
NON-EVALUATED WETLANDS

Wetland System No.	Location	Acres	Type	Current Use	Comments
DALTON					
D-1	NE corner of Town - North of Weston Mt.	33	WS	Wetland Wildlife (17 acres in Dalton, 10 acres in Windsor)	6 acres not in watershed
D-2	NE portion of town Weston Mt.	8	WS	Wetland Wildlife	Only 6 of 8 acres located in watershed area
D-3	North central portion	70	WS	Wetland Wildlife	Only 28 of 70 acres located in W/S area
D-5	Appalachian Trail	7	WS	Wetland Wildlife	Drains into Walker Bk.
D-7	East Housatonic St.	1	SM	Wetland Wildlife	Small depression dominated by *Typha* sp.
HANCOCK					
H-1	Berry Pond Road	3,8	OW,SS	Wetland Wildlife, Hiking, Nature Study	Located in Pittsfield State Forest
PITTSFIELD					
P-7	Churchill St.	3	SS	Wetland Wildlife	None Observed
P-10	Bet. Fort Hill Ave. & Eleanor Rd.	8,1	WS,OW	Wetland Wildlife	None Observed
P-13	Rt. 20 & Stearns Rd.	3	SS	Wetland Wildlife	25' x 15'
P-20	Pittsfield Airport	5	SS	Wildlife	None Observed
P-21	Bet. So. Mtn. Rd. & Tamarack Rd.	9	SS	Wildlife	None Observed
P-27	End of Montview St. off Rt. 7, near Lakeview Terrace	28	WS	Wildlife	1' x 2' stream
P-29	Clark Rd. off Crane Ave.	4	SS	Wildlife	4' x 2' brook
P-30	Gen. Elec. Ath. Assoc.	4	SS	Wildlife	None Observed
P-31	North Jr. High School	5	SS	Wildlife	None Observed
P-37	Pomeroy Ave.	5	SS	Wildlife	None Observed
P-38	Rt. 9, Dalton-Pittsfield Boundary	17	SF (abandoned field)	Wetland Wildlife	None Observed
PERU					
PE-2	Rice Road	3	SS	Wetland Wildlife	Owned by Dorothy F. Rice Wildlife Refuge
PE-3	Route 143	3	SS	Wetland Wildlife	No observed drainage outlet
PE-7	Raymond Road	3	SF	Wetland Wildlife	No observed drainage outlet
WASHINGTON					
WA-1	Pittsfield Road	5	SS	Wetland Wildlife	Hathaway Brook measures approx. 12' wide x with 5' banks
WINDSOR					
W-1	Back Dalton Road	2	SS	Wetland Wildlife	No observed drainage outlet
W-2	Back Dalton Road	3	SS	Wetland Wildlife	No observed drainage outlet
W-3	Flintstone Road	11	WS	Wetland Wildlife, Hunting	No observed drainage outlet

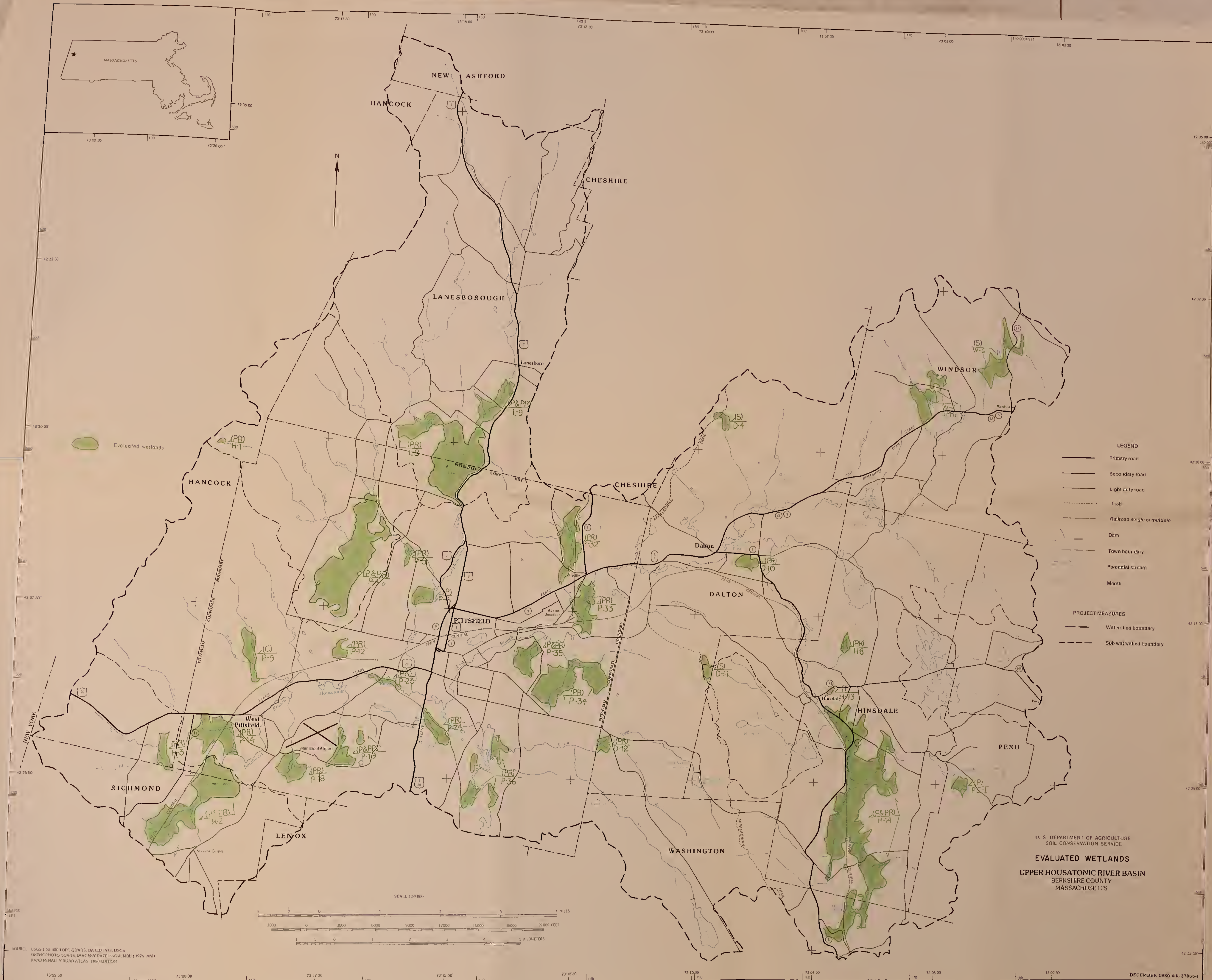
A sample Wetland Field Evaluation Form is included at the end of this appendix. The sample form indicates the step-by-step procedure followed to obtain the evaluation ratings in Table B-1.

Wetland areas under three acres in size and wetlands that were inaccessible were not evaluated unless they were unique or appeared to be unusually valuable. Basic data concerning these non-evaluated wetlands are presented in Table B-2.

Table B-3 summarizes the acreage of various types of wetlands in the communities that lie at least partially within the Basin. Wetland acreages include all wetland areas within a community, not only those wetlands within the Basin boundaries. Individual wetland areas were classified as to type based on their dominant vegetation. However, many wetlands are comprised of several vegetational communities (i.e., shrub swamp may also contain lesser amounts of shallow marsh); thus Table B-3 may overstate some of the more prevalent wetland types and understate the area of some of the less common types.



DECEMBER 1980 BASE 4-R-37865



USDA-SCS-FORT WORTH TEXAS 1982

DECEMBER 1980 BASE 4-R-37865

180 000 FEET
73°02'30"
42°35'00"
580 000
FEET
570
42°32'30"
560
42°30'00"
550
8A
Windsor
9
LEGEND
Primary road
Secondary road
Light duty road
Trail

WETLANDS INVENTORY ACREAGE SUMMARY*

Town \ Wetland Type	OW	DM	SM	SS	WS	WM	B	SF	BP	Total	Comments
Windsor	35	0	0	162	231	80	0	0	2	510	32 acres of OW consists of portion of Windsor Reservoir located within Windsor
Washington	132	9	29	49	51	0	0	0	0	270	111 acres of OW consists of Ashley Lake, 6 acres of OW consists of Ashley Reservoir
Peru	36	0	6	14	149	0	0	3	0	172	23 of the 36 acres of OW comprise the portion of Ashmere Lake located in Peru
Hancock	8	0	0	12	41	0	0	0	0	61	Only 4 acres of OW comprise evaluated or non-eval. wetlands
Richmond	146	9	80	34	167	0	0	0	0	290	
Dalton	27	0	6	29	170	26	4	5	0	267	
Pittsfield	969	85	109	336	847	41	0	256	0	2,642	Inventoried OW acreage includes Silver Lake (24 acres) and Pitts-field portion of Pontoosuc Lake (222 acres)
Lanesboro	258	12	18	216	26	5	0	3	0	520	
Hinsdale	509	11	118	318	837	0	4	0	0	1,797	
TOTALS	2,120	126	366	1,170	2,519	152	8	267	2	6,529	

*Acreage figures include both evaluated and non-evaluated wetlands.

The following section presents a brief discussion of some of the most significant wetland areas in the Upper Housatonic River Basin based on the number of parameters receiving high ratings. Some other wetlands are included in the discussion because of their uniqueness. Also included are discussions of 16 wetland areas that were prepared by the Massachusetts Division of Fisheries and Wildlife. These independent evaluations report on areas determined to be of special importance as wildlife habitat.

DALTON

Center Pond and its associated wetlands represent the largest and perhaps most heavily used wetland system in Dalton. Its location, in the center of town, adds to its uniqueness, high visual quality, and easy accessibility. This wetland system received six high ratings. Evaluation by the Massachusetts Division of Fisheries and Wildlife indicates that the area contains a greenbelt of cottonwood, red maple, alder, forbs, and grasses with flats of cattails. This habitat provides nesting sites for red-winged blackbird, mallard, and Canada goose. Great blue heron wade in the shallows in the summer months; tree swallow and kingfisher nest nearby. Mammalian species residing in the area include raccoon, muskrat, mink, weasel, and occasionally beaver. Reptiles and amphibians include green frog, bullfrog, snapping turtle, painted turtle, and common water snake.

Wetland systems #4, 10, 11, and 12 received high uniqueness values due to their groundwater favorability potential. Two wetland systems (#4 and #11) are located along the Appalachian Trail.

HANCOCK

The two most significant wetland areas in Hancock are (H-1) Tilden Swamp and (H-3) Berkshire Downs. The Tilden Swamp area is adequately protected, being located within the Pittsfield State Forest. The Berkshire Downs wetland area is privately owned and represents a potential aquifer recharge area.

HINSDALE

Wetland System #8 - This is the only deep marsh in the town and received medium and high rankings for each parameter evaluated. In addition, this wetland has a moderate to high flood control potential.

Wetland System #13 - This wetland referred to as the Town Bog represents the unique presence of a wetland area in the center of town. With the Kittredge School and local residents in such close proximity to the wetland, its potential for nature study and passive recreation should not be overlooked. It was noted that wetland infringement was occurring from the Town Garage at the time of the field investigation for this study.

Wetland System #14 - Although most of this wetland system is currently owned and managed by the Massachusetts Division of Fish and Game, it is important that the integrity of the area be maintained. This area provides very significant flood control and storm damage prevention and a diversity of recreational and educational opportunities.

The area also contains Muddy Pond. According to the Massachusetts Division of Fisheries and Wildlife, Muddy Pond itself is an important resource as furbearer habitat; mink, muskrat, otter, raccoon, and beaver are found here. It is very limited as a waterfowl production area. Continuing north along the river's course the habitat changes to a wooded swamp with vegetative types including red maple, spruce, and poplar along the uplands; and alder, willow, dogwood, and meadow sweet throughout the river bottom. The brushy thickets are also supplemented by swales consisting of reed canarygrass, sedges, rushes, and meadow sweet. As well as the furbearers listed above, other mammals reside in this river corridor, including long-tailed weasel, white-tailed deer, black bear, red squirrel, cottontail and snowshoe hare to list a few. Resident birdlife includes varieties of warbler, catbird, field sparrow, white-throated sparrow, common grackle, swamp sparrow, red-winged blackbird, red-tailed hawk, red-shouldered hawk. At the northeast portion of this corridor snipe and woodcock have been reported as nesters. Upland game birds, ruffed grouse, ring-necked pheasant, and wild turkey are nesters along this area. An elevated flood plain protected by almost impenetrable brush in places, provides a natural refuge and reservoir for various forms of wildlife.

Wetland System #19 - This wetland represents the only true bog in the town and one of the few in the county. This area is both geologically and botanically unique and efforts should be made to protect its future existence.

LANESBOROUGH

Wetland Systems #8 & 9 - Both these wetland systems directly border on Pontoosuc Lake, at the mouths of Secum and Town Brooks, respectively, with wetland system #9 extending into the middle reaches of Town Brook. The value of these wetlands is illustrated by the high wetland wildlife habitat, nature study, uniqueness, and visual quality ratings received. These wetland areas are the only remaining wetland areas bordering Pontoosuc Lake.

In addition, all the wetland systems bordering either Secum or Town Brook provide a certain degree of flood retention capacity. These wetlands are privately owned except for areas owned by the Lanesborough Village Fire and Water District along Town Brook.

According to the Massachusetts Division of Fisheries and Wildlife, the Town Brook wetland vegetation consists of speckled alder, willow, dogwood, and meadow sweet interspersed with grasses and sedges. Fair to good woodcock nesting and feeding habitat exists. Catbird, cedar waxwing, kingbird, and varieties of warbler may be found at various times of the year. Muskrat, mink, raccoon, and occasionally beaver frequent this area wetland. Some reptiles and amphibians found here are the wood turtle, common garter snake, eastern ribbon snake, American toad, spring peeper, and wood frog.

The Division personnel found that in the Secum Brook wetland the east or lake side of the area has vegetation which includes duckweed, waterlily, pondweed, water milfoil. Waterfowl species frequenting the wetland are mallard, black duck, wood duck, Canada goose as nesters and teal as migrants. Also tree swallow, kingfisher, American bittern, great blue heron, green heron, and woodcock are found along the western edges. Mammals include little brown bat, muskrat, and mink. Raccoon and skunk frequent the shorelines. Reptiles and

amphibians include bullfrog, spotted turtle, eastern painted turtle, snapping turtle, spring peeper, and common water snake. The backwaters provide an important loafing site for waterfowl during migrating periods.

PERU

The Tracy Pond wetland, located off of Middlefield Road, is a high value wetland that received five high ratings. Although not observable from the road, this wetland is highly aesthetic and appears to be heavily used. Trails border the perimeter of the wetland and camping occurs in the adjacent uplands. The area is owned by the Y.M.C.A. of Pittsfield and the Middlefield State Forest borders it on the south.

The Massachusetts Division of Fisheries and Wildlife indicates that Tracy Pond is an enlarged natural pond with small cattail and alder thickets, surrounded by steep slopes forested with spruce, fir, and hemlock. The south end of the pond consists of an inlet stream with a cattail marsh. There are some bog indicators, such as sundews and sphagnum moss at various locations along the shoreline, with pond lilies found in the deeper water. Artificial nesting structures located on the pond's edge encourage hooded merganser and wood duck. Canada geese are also reported as nesters. Other nesting avian species found in this area include tree swallow, barred and great horned owls, phoebe, red-winged blackbird, and possibly red-shouldered hawk. Piliated woodpeckers nest in the woodlands adjacent to this body of water. Resident mammalian species include otter, beaver, mink, muskrat, raccoon, skunk, red fox, white-tailed deer, and black bear. Some of the reptiles and amphibians found in the wetland include the garter snake, snapping turtle, painted turtle, wood frog, spring peeper, pickerel frog, common newt, red-backed and northern two-lined salamanders.

PITTSFIELD

P-4 - This wetland system is comprised of Onota Lake and a variety of wetland types at its northern end. Onota Lake provides excellent fishing and recreation potential. The wetlands at its northern end provide valuable wildlife habitat, fish spawning grounds, and sediment filtration of incoming waters.

According to the Massachusetts Division of Fisheries and Wildlife the wetland is a shrub and tree swamp including the following species: alder, willow, red maple, and American elm. A variety of waterfowl nest in this area including wood duck, black duck, mallard, and Canada goose. The lakeside vegetation of this wetland includes duckweed, water lily, pondweed, water shield, and water milfoil. Muskrat, mink, raccoon, common newt, green frog, bullfrog, snapping turtle, eastern painted turtle, and common water snake are found commonly in this area. Great blue heron and bittern visit on a seasonal basis.

P-5 & P-6 - These wetland systems consist of the Peck's Pond and Wahconah Park areas, respectively. Both systems received high nature study and uniqueness ratings, based partly on their urban setting. In addition, both areas showed moderate groundwater favorability. P-6 is publicly owned; P-5 is not.

P-9 - This wetland system is located south of Berkshire Community College (BCC), along May Brook. Part of the area is owned by BCC and is extensively used for

environmental education by the college. Due to its diversity of wetland types, the area attracts a significant number of migrating birds.

P-12 - This wetland area, located along Maloy Brook, is comprised predominantly of shallow marsh and received high ratings for wetlands wildlife habitat, nature study, and uniqueness. Although not very large (28 acres), its location in an urban setting, is unique.

Evaluation of the wetland by the Massachusetts Division of Fisheries and Wildlife indicated a shallow fresh marsh with a vegetational composition consisting mainly of cattails, grasses, sedges progressing upland to alders, willows, tamarack, poplar, and white pine. Roundleaf sundew has been found in some areas of this wetland. Some of the nesting birds include American bittern, green heron, alder flycatcher, mallard, and Canada goose. Reptiles and amphibians include Wood frog, spring peeper, spotted turtle, painted turtle, and common garter snake. Mammalian residents include muskrat, mink, raccoon, white-tailed deer, and skunk.

P-14 - This wetland area measures 86 acres and received high ratings for wetland wildlife, nature study, and uniqueness. Its uniqueness rating is based on its moderate groundwater favorability. The Massachusetts Division of Fisheries and Wildlife found that this wetland is primarily of the shallow marsh type with soils waterlogged during the growing season. Water levels vary from a few inches to a few feet depending on the season. The area to the west of the railroad bed has had a history of beaver dam inundation, the culvert under the railbed providing the dam site. A small pond has resulted from this beaver activity, providing habitat for Canada goose, mallard, and black duck. Vegetation adjacent to this pond is of a mixed variety consisting of grasses, sedges, cattails, and meadow sweet graduating into shrubs of alder and willow. These vegetative types provide habitat for the American bittern and woodcock, as well as upland species such as the ring-necked pheasant during the winter months. Furbearers found in this wetland include beaver, muskrat, mink, raccoon, and occasionally otter. The peripheral zone of the habitat consists of seasonally flooded and wooded swamp wetland consisting primarily of the following species: red maple, American elm, eastern hemlock, tamarack, and yellow birch. The following wildlife species frequent this type of habitat: raccoon, ruffed grouse, and white-tailed deer. Records indicate occasional sighting of black bear traveling through the northwest portion of this wetland.

P-18 - This area referred to as Mud Pond measures about 90 acres and is comprised predominantly of wooded swamp and deep marsh. This system received high ratings for warm water fish habitat, wetland wildlife habitat, nature study, uniqueness, and visual quality. Although receiving these ratings, the area appears to be underutilized.

According to the Massachusetts Division of Fisheries and Wildlife, this area is a shallow pond with water usually less than 10 feet in depth, and is fringed by a border of emergent vegetation. The open water vegetative types include pondweeds, water milfoils, and water lilies. This bog once productive of pitcher plants has been all but destroyed. Leatherleaf and shrubby cinquefoil are found here. The shore is dominated by speckled alder, red dogwood-osier and buckthorn, cattail, and highbush blueberry. This area was once a bog of high enough quality to produce the only record in Massachusetts of the bog turtle.

Mammalian species in this area include muskrat, mink, weasel, raccoon, and occasionally beaver. Waterfowl nesting in this area include Canada geese, mallards, black ducks, and wood ducks. These species nest in nearby dead trees and in the artificial nesting structures as well. The area also provides nesting sites for tree swallows and screech owls. The common water snake, snapping turtle, painted turtle, bullfrog, and green frog are found here.

P-19 - This wetland area, referred to as Wild Acres, is under the jurisdiction of the Pittsfield Conservation Commission. This area received many high ratings and is actively used. The Massachusetts Division of Fisheries and Wildlife indicates that the so-called "airport swamp" is a beaver-flooded swamp. The most predominant tree species are tamarack and spruce, most of which have been killed by the inundation. Beaver make occasional appearances depending on local populations although the area is pretty well eaten out. The ponding effects of the dams provides habitat for other furbearers such as raccoon, skunk, muskrat, and otter. Wood ducks are produced in nesting structures; mallard, and Canada geese are also nesters.

P-23 - This wetland system is valuable in that it forms a greenbelt along a portion of the Southwest Branch of the Housatonic River, in a relatively urban portion of the city. It received high and medium ratings for all parameters except waterfowl hunting.

P-24 - This wetland system is under quasi-public ownership, being owned by the Pittsfield Country Club and is referred to as Morewood Lake. The lake is used for swimming and fishing. This system received high and medium ratings for all evaluated parameters except waterfowl hunting.

P-32 - This wetland system is located along Unkamet Brook and is classified as a high groundwater favorability area. In addition to this resource value, its location in an intensely developed urban area and its value as a nesting area for migrating birds, makes this system quite unique.

P-33 & P-34 - These two wetland systems are important in that they provide a greenbelt along a section of the East Branch of the Housatonic River. These two wetland systems provide a contiguous area of over 500 acres of wetlands along this branch of the Housatonic. This area, however, has been plagued by PCB contamination.

The Massachusetts Division of Fisheries and Wildlife appraisal indicates that the eastern portion of the Brattle Brook wetland consists of seasonally flooded swales providing habitat for varieties of warbler, catbird, sparrow, grouse, woodcock, pheasant, grackle, red-winged blackbird. This habitat is interspersed with alder thickets and to the west a seasonally flooded wooded swamp consisting of red maple, elm, eastern hemlock, spruce, tamarack, and yellow birch, providing habitat for raccoon, squirrel, white-tailed deer, porcupine, and skunk. Reptiles and amphibians include but are not limited to common garter snake, eastern ribbon snake, wood frog, common newt, spring peeper, and wood turtle. The northern and eastern sections of this area provide nearby urban dwellers an area for nature appreciation and sport hunting of the game species listed above.

P-35 - This wetland system, known as Goodrich Pond, is located within Brattle Brook Park and is under the ownership of the city of Pittsfield. This area has great recreational and educational potential due to its urban setting. Goodrich Pond, according to the Massachusetts Division of Fisheries and Wildlife, is an

open body of water surrounded by a narrow zone of shrub swamp. These shrubs are alder, willow, red dogwood-osier, sweetgale, and leatherleaf mixed with red maple and poplar. Cattails are intermixed with sweetgale and Spirea. Watearrum has been found along the southern shoreline. Nesting birds include least bittern, green heron, black duck, mallard, red-winged blackbird, tree swallow, and woodcock. Mammals include muskrat, raccoon, mink, and weasel. Reptiles and amphibians include wood frog, peeper, green frog, bullfrog, snapping turtle, common water snake, and garter snake. The wetland is important in that it is a productive urban wildlife area with easy access to the viewing public.

P-36 - This wetland system is predominantly quasi-publicly owned (Massachusetts Audbon Society) and provides a greenbelt along the Housatonic River. The area is extensively used for canoeing, birdwatching, hiking, cross-country skiing, and nature education. This area received high and medium ratings for all evaluated parameters except waterfowl hunting.

Brielman Swamp in the Housatonic Valley Wildlife Management Area is located in a backwater of the Housatonic River near the Pittsfield sewage treatment plant. The Massachusetts Division of Fisheries and Wildlife evaluation found that this wetland is of the shallow fresh marsh type, with the soil being waterlogged during the growing season and often covered with six inches or more of water. Vegetation includes willow, alder, red dogwood-osier along the bankings and cattail, arrowhead, pickerel weed, sedge, and smartweed in deeper water. This area is reported to have nesting of snipe, American bittern, Gallinule, Virginia rail, sora rail, blue-winged teal, mallard, flycatcher, swamp sparrow, red-winged blackbird, and tree swallow. Migratory visitors include egret, pintail, glossy ibis, great blue heron, and green heron. The area is most unique for its juxtaposition to the old filter and settling beds creating an attraction to migratory birdlife of all types. Mammals commonly found in the area include red fox, raccoon, mink, muskrat, and weasel. Reptiles and amphibians include but are not limited to common garter snake, eastern ribbon snake, spring peeper, leopard frog, green frog, bullfrog, and snapping turtle.

RICHMOND

The most significant wetland area in Richmond is the (R-2) Richmond Pond wetland system. This system received high ratings for all evaluated parameters. This system is comprised of a variety of wetland types and has a particularly high recreation and wildlife value.

According to the Massachusetts Division of Fisheries and Wildlife, this area is one of the larger cattail swamps in Berkshire County and is unique in this respect. It is also an area of major wildlife and water conservation value as well. In addition to the predominance of cattails, other vegetative types include sedges, grasses, rushes, and meadow sweet. The outer margins consist of alder, willow, red maple, poplar, white pine, and hemlock on the uplands. This type of habitat provides the nesting requirements for the following: black duck, mallard, Canada goose, teal, and a few wood duck. American bittern is a probable nester. Passerines include a large variety of species in this area. Upland game birds such as pheasant, grouse, and wild turkey may be found along the perimeters during the winter months in search of food and water. Mammals frequenting or residing in this area include muskrat, mink, beaver, skunk, raccoon, red fox, and white-tailed deer.

WASHINGTON

Muddy Pond (WA-3) represents a highly valuable wetland system, receiving high ratings on eight of the nine evaluated parameters. Five different wetland types comprise this system, leading to its high ratings and recreation potential. This area is privately owned and forms the headquarters of the East Branch of the Housatonic River.

The Massachusetts Division of Fisheries and Wildlife indicates that the wetland is acid bog habitat between Upper Valley Road and Route 8, Washington. Specialized acid bog plants are present such as sphagnum mats, sundew, pitcher plants, and laurels. A variety of passerine birds inhabit the area. The furbearers reported in this area include otter, mink, muskrat, raccoon, and beaver. The bog is a unique area for this drainage system.

WINDSOR

The two most significant and largest wetland systems in Windsor are W-4, along Tyler Brook, and W-6 at the Gene Moran Wildlife Management Area. Both these systems received high ratings for wetland wildlife habitat and nature study and are potential groundwater favorability areas.

Area W-6, according to the Massachusetts Division of Fisheries and Wildlife, is an inland deep fresh marsh (6"-3' or more of water), surrounded by a shrub swamp type habitat consisting of willow, alder, dogwood, and sweetgale meadow sweet mix. The wetland provides habitat for olive-sided flycatcher, varieties of warbler, snipe, woodcock, grouse, American bittern, marsh hawk, green-wing teal, black duck, wood duck, and tree swallow. Such furbearers as beaver, muskrat, otter, mink, long-tailed weasel, and raccoon are residents of the wetland as well as the following: common newt, spring peeper, pickerel frog, green frog, painted turtle. There is a possibility of short-billed marsh wren nesting in the adjacent swales.

MNRPP-MRBPP-FRESHWATER WETLAND FIELD EVALUATION FORM

WETLAND EVALUATION FORM

1. Date: ______________ 2. Investigator: ________________ 3. Wetland No.: ______________

4. Wetland Name: ________________________ 5. Location (town & road): ______________

6. Ownership (public or private): ____

7. Drainage System: ________________________ 8. Access to Wetland (Road, path, powerline etc.) and quality: ________________

9. Wetland Type(s) (indicate acres of each type which comprises entire wetland - letter in parentheses is code used on "Land Use and Vegetative Cover Map for each wetland type):

(W) Open Water: _____ Acres

(DM) Deep Marsh: _____ Acres

(SM) Shallow Marsh: _____ Acres

(SS) Shrub Swamp: _____ Acres

(M) Wet Meadow: _____ Acres

(B) Bog: _____ Acres

(SF) Seasonally Flooded Flat: _____ Acres

(BP) Beaver Pond: _____ Acres

(HS, SH, H, S, P) Wooded Swamp: _____ Acres

10. Total Size: _____ Acres

11. Current Use(s): _____ Fishing, _____ Boating; _____ Hiking; _____ Education, _____ Water Supply, _____ Agriculture; _____ Mining; _____ Wetland Wildlife, _____ Hunting,

Other (specify) ____

12. Comment: ____

____

____

WETLAND EVALUATION FOR WARM WATER FISH HABITAT - Circle the most correct choice for each line below.

ATTENTION: There must be some open water (W) present in order to evaluate the wetland for warm water fish habitat.

	HIGH	MEDIUM	LOW
13. Principle Wetland Type (Refer to Question #9)	(W) Open Water	(DM) Deep Marsh with some (W) Open Water	Other Types
14. Acres of (W) Open Water (Refer to Question #9)	More than 10 Acres	2 to 10 Acres	Less than 2 Acres
15. Location of Wetland	Abuts pond or lake which supports warm water fish	Abuts perennial stream which supports warm water fish	Abuts intermittent stream or cut off from stream
16. Presence of fish cover	>25%	10 - 25%	<10%
17. Species of sport fish present (Bass, Bluegill, Perch, Pickerel, Northern Pike)	2 or more ____________	1 ____________	None ____________
Total number of items circled in each category:	_____ HIGH	_____ MEDIUM	_____ LOW

Calculation: Number of circled items in High column x 2 + number of circled items in Medium column x 1 = Rank Number

High____x 2 + Medium____x 1 = _____ If total is: 8 to 10 = HIGH
5 to 7 = MEDIUM
0 to 4 = LOW

Rank for Warm Water Fish Habitat: ______________

WETLAND EVALUATION FOR WETLAND WILDLIFE HABITAT - Circle the most correct choice for each line below.

		HIGH	MEDIUM	LOW
18.	Principle Wetland Type (Refer to Question #9)	(SM) Shallow Marsh or (DM) Deep Marsh	(W) Open Water or (SS) Shrub Swamp or (WS) Wooded Swamp	All other types
19.	Number of Wetland Types (Refer to Question #9)	3 or more	2	1
20.	Surrounding Land Use(s)	2 or more of the following constitute over 90% of surrounding land use: 1. forestland, 2. agricultural and open land	1 or more of the following constitute 50 - 90% of surrounding land use: 1. forestland; 2. agricultural or open land (or) 1 of the preceding constitutes more than 90% of surrounding land use	1 or more of the following constitute less than 50% of surrounding land use: 1. forestland, 2. agricultural or open land
21.	Percent of perimeter with 300'+ buffer not occupied by buildings or other urban uses	80% or more	60% to 80%	less than 60%
22.	Total size (Refer to Question #9)	Over 10	3 to 10 Acres	less than 3 Acres
23.	Are islands present	2 or more	1	No
24.	Wetland Location	Wetland is in a floodplain and abuts a lake or pond or stream	Wetland is in a floodplain but is isolated from body of water or stream or wetland is in upland and abuts a lake or pond	Wetland is in upland and is isolated from any body of water

WETLAND EVALUATION FOR WETLAND WILDLIFE HABITAT

Calculation: Number of circled items in High column x 2 + number of circled items in Medium column x 1 = Rank Number

High_____ x 2 + Medium x 1 = _____

If total is: 10 to 14 = HIGH
5 to 9 = MEDIUM
0 to 4 = LOW

Rank for wetland wildlife habitat: _____

WETLAND EVALUATION FOR RECREATION - BOATING (Canoe or Flat Bottom) - Circle the most correct choice for each line below.

	HIGH	MEDIUM	LOW
25. Principle wetland type used for boating (Refer to Question #9)	(W) Open Water	(DM) Deep Marsh with some (W) open water present	(DM) Deep Marsh or any other type with no open water present
26. Acres of continuous (W) Open Water and (DM) Deep Marsh available for boating (Refer to Question #9)	More than 30 Acres	10 to 30 Acres	Less than 10 Acres
27. Number of access points for a canoe or flat bottom boat	2 or more	1	None
28. Presence of boatable stream	Stream enters and leaves wetland	Stream enters or leaves wetland	No stream present
Number circled in each column	____HIGH	____MEDIUM	____LOW

Calculation: Number of circled items in High column x 2 + number of items circled in Medium column x 1 = Rank Number

High____ x 2 + Medium____ x 1 = ____

If total is: 7 to 8 = HIGH
4 to 6 = MEDIUM
0 to 3 = LOW

Rank for Recreation - Boating: ____

WETLAND EVALUATION FOR RECREATION - SHORELINE FISHING - Circle the most correct choice for each line below.

	HIGH	MEDIUM	LOW
29. Principle wetland types used for fishing (Refer to Question #9)	(W) Open Water	(DM) Deep Marsh with some (W) Open Water present	No (W) Open Water present
30. Acres of combined wetland types - (W) Open Water and (DM) Deep March (Refer to Question #9)	More than 10 Acres	3 to 10 Acres	Less than 3 Acres
31. Percent of shoreline from which fishing is possible	More than 20%	5% to 20%	Less than 5%
32. Access for Fishing	Unlimited	Permission of land-owner required	Not available
Number of items circled in each column:	____HIGH	____MEDIUM	____LOW

Calculation: Number of circled items in High column x 2 + number of items circled in Medium column x 1 = Rank Number

High____ x 2 + Medium____ x 1 =

If total is: 7 to 8 = HIGH
4 to 6 = MEDIUM
0 to 3 = LOW

Rank for Recreation - Shoreline Fishing: ________

WETLANO EVALUATION FOR RECREATION - NATURE STUOY - Circle the most correct choice for each line below.

	HIGH	MEDIUM	LOW
33. Diversity of wetland types (Refer to question #9)	3 or more	2	1
34. Percent of urban development within 300 feet of wetland edge	Less than 5%	5% to 25%	Greater than 25%
35. Foot trail access	Available	Feasible to develop	Not feasible to develop or only at very high cost
36. Proximity of elementary and high schools	Wetland is adjacent or within 1/2 mile	Wetland is 1/2 to 5 miles	Wetland is further than 5 miles
37. Number of environmental quality problems: Water quality, Air quality, Noise level, Visual misfits	No environmental quality problems	1 environmental quality problem	More than one environmental quality problem
38. Rank received for uniqueness (Refer to uniqueness evaluation)	High	Medium	Low

Number of items circled in each column: _____HIGH _____MEDIUM _____LOW

Calculation: Number of circled items in High column x 2 + number of items circled in Medium column x 1 = Rank Number

High_____ x 2 + Medium x 1 = _____

If total is: 9 to 12 = HIGH
5 to 8 = MEOIUM
0 to 4 = LOW

Rank for Recreation Nature Study: __________

WETLANO EVALUATION FOR RECREATION - HUNTING WATERFOWL - Circle the most correct choice for each line below.

	HIGH	MEDIUM	LOW
39. Combined acres of (W) Open Water, (DM) Deep Marsh, (SM) Shallow Marsh which is further than 500 ft. from occupied dwellings and more than 150 ft. from a public way (Refer to Question #9)	More than 30 Acres	10 to 30 Acres	Less than 10 Acres
40. Access for Hunting	Unlimited	Permission of landowner required	No hunting allowed
41. Principle wetland type	4	3 or 5	Other

Number of items circled in each column: _____HIGH _____MEDIUM _____LOW

Calculation: Number of circled items in High column x 2 + number of circled items in Medium column x 1 = Rank Number

High_____ x 2 + Medium x 1 = _____

If total is: 5 to 6 = HIGH
3 to 4 = MEOIUM
0 to 2 = LOW

Rank for Recreation - Waterfowl Hunting: _________

WETLAND EVALUATION FOR UNIQUENESS - Circle the most correct choice for each line below.

	HIGH	MEDIUM	LOW
42. Location - The wetland is surrounded by:	Built up/intensely urban	Scattered residential	Rural--very little development
43. Wetland contains a rare or uncommon species of plant or animal	A rare species	An uncommon species	Neither
44. Wetland contains a locally rare or uncommon plant community	Yes	--	No
45. Wetland attracts a significant number of migrating birds	Yes	--	No
46. Wetland is archaeologically, geologically or historically significant	Yes	--	No
47. Wetland size (Refer to Question #10)	Larger than 200 Acres	50 to 200 Acres	Smaller than 50 Acres
Number of circled items in each column:	_____HIGH	_____MEDIUM	_____LOW

Calculation: Number of circled items in High column x 2 + number of circled items in Medium column x 1 = Rank Number

High x 2 + Medium x 1 = __________

If total is: NOTE: If any item in 43 to 46 is marked as HIGH, rating for uniqueness is high

0 to 2 = LOW
3 to 6 = MODERATE

Rank for Uniqueness is: _______

WETLAND EVALUATION FOR VISUAL QUALITY - Circle the most correct choice for each line below.

	HIGH	MEDIUM	LOW
48. One or more public roads enables travelers to overlook the wetland at:	3 or more different locations or for 1 mile or more	2 different locations or for 1/4 mile or more, but less than 1 mile	1 location or less than 1/4 mile
49. Overlook accessible by path or trail	2 or more overlooks accessible	1 overlook accessible	No overlooks accessible
50. Wetland contains some attractive foliage or flowers and deciduous trees and shrubs (consider all seasons)	More than 50% deciduous trees and shrubs and many attractive flowers and foliage	25 to 50% deciduous trees and shrubs and a moderate amount of attractive flowers and foliage	Less than 25% deciduous trees and shrubs and very few attractive flowers and foliage
51. Surrounding topography provides potential for developing overlooks	Potential for 2 or more overlooks	Potential for 1 overlook	No potential for an overlook
52. Wetland contains an island which is visible from shoreline	Yes	--	No
53. Appearance and condition	Undisturbed and natural	Somewhat disturbed and littered	Messy, littered, junky

WETLAND EVALUATION FOR VISUAL QUALITY (Contd.)

	HIGH	MEDIUM	LOW
54. Wetland types present (Refer to Question #9)	Wetland contains some visible (W) Open Water or (DM) Deep Marsh	Wetland contains some visible (M) Wet Meadow or (SM) Shallow Marsh	Wetland contains no visible (W) Open Water, (DM) Deep Marsh, (M) Wet Meadow or (SM) Shallow Marh

Number of circled items in each column: _____HIGH _____MEDIUM _____LOW

High_____ x 2 + Medium_____ x 1 = _____

If total is: 10 to 14 = HIGH
5 to 9 = MEDIUM
0 to 4 = LOW

Rank for Visual Quality is: _______________

WETLAND EVALUATION

Wetland Name: ______________________________ No. ________

FLOOD CONTROL

CRITERION	RANGE		Circle correct RATING
1. Effective storage of wetland on total watershed above.	<1" runoff		[illegible]
	1" - 3" runoff		6
	>3" runoff		9
2. Effective storage of upstream reservoirs and wetlands on total watershed.	<[illegible]" runoff		[illegible]
	[illegible]" - [illegible]" runoff		[illegible]
	>[illegible]" runoff		1
3. Effective storage on main stem between wetland and Potential Damage Area or major confluence.	<[illegible]" runoff		[illegible]
	1" - [illegible]" runoff		[illegible]
	>[illegible]" runoff		
4. Distance downstream to Potential Damage Area	<[illegible]		[illegible]
	[illegible]		[illegible]
	[illegible]		
5. Severity of Potential Flood Damage (downstream)	<[illegible]	Low	2
		Moderate	[illegible]
	or	High	[illegible]
	[illegible]	Low	1
	[illegible]	Moderate	2
	[illegible]	High	4
	[illegible]		

[illegible]: __________

RATING - [illegible]

[illegible]: ______

APPENDIX C

BASIC DATA AND BACKGROUND ANALYSES

RELATED TO THE LAKE EUTROPHICATION PROBLEM AND CONCERN

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This appendix presents the results of a water quality monitoring program undertaken in the Basin to obtain data to assist in improving understanding of the nutrients being contributed by the lake watersheds. Data obtained were especially useful in determining the phosphorus content of suspended sediment and corroborating the 208 study estimate of 2.6 pounds of total phosphorus per ton of sediment.

This appendix also reports on several other studies that were made to obtain basic data concerning phosphorus contribution from non-farm fertilizer, phosphorus content of soil, and phosphorus content of lake sediment.

A survey of lakeshore residents was made to determine non-farm use of fertilizer by property owners around Pontoosuc and Onota Lakes. The data confirm the 208 contention that phosphorus supplied to the lakes from lawn fertilizers was insignificant.

Phosphorus content of several soil samples from the Pontoosuc Lake watershed was determined. Phosphorus was found to vary between 10 and 930 mg. per kilogram of soil (0.02 pounds to 1.86 pounds per ton of soil).

Samples of the bottom sediment from Pontoosuc Lake were analyzed for phosphorus content. Sediment samples were obtained in shallow areas close to shore as well as in the deepest part of the lake. Phosphorus content varied from 80 to over 500 mg. per kilogram of sediment in the shallow areas and ranged from 36 to 290 mg. per kilogram in the deeper areas of the lake.

The water quality data and other analyses are provided in this appendix in the hope that they will prove useful to future researchers developing measures to mitigate lake eutrophication problems.

Water Quality Monitoring

Water quality sampling stations were established at 13 locations in the watersheds of the five lakes under study. Table C-1 indicates the station locations.

A recording stream gauging station was established in the Pontoosuc Lake watershed on Town Brook at Bridge Street in Lanesborough. An automatic water quality sampler installed at the stream gauge site collected water samples during periods of high flow. Operation of the sampler was initiated when stream water levels reached a pre-set elevation. The sampler continued to take samples at regular time intervals until all sample containers were used or the sampler was manually shut off.

At other sampling locations, the water quality samples were obtained manually. Soil Conservation Service personnel assisted by Betsy Bean of Lanesborough, Joe Madison of Hinsdale, and Pat Sanginetti of Pittsfield, collected samples during high flow periods.

The majority of the water quality sampling was done at the Town Brook site in Lanesborough. The stream discharge information generated by the stream gauging equipment facilitated the estimation of the quantity of various substances following laboratory determination of concentrations.

Although stream discharge information was not available for sampling sites other than Town Brook, the Town Brook data can be used to estimate quantities of various parameters.

Table C-1. Lake Watershed Water Quality Sampling Stations

Lake	Station Number	Drainage Area Square Miles	Location and Remarks
Ashmere	A-1	1.1	Unnamed brook 800 feet northeast and upstream of culvert on Rt. 143. Culvert flows from small pond (2 ac.) into Ashmere Lake. Station is on Peru-Hinsdale townline in Peru. (Peru USGS Quad Sheet)
Onota	O-1	2.7	Daniels Brook at Hancock Road culvert, Pittsfield. (Pittsfield West Quad Sheet)
Plunkett	PR-1	1.7	Welch Brook, approximately 200 feet upstream of Persips Road, Hinsdale. (Pittsfield East Quad Sheet)
Richmond	R-1		Mt. Lebanon Brook, at Rt. 41 culvert, Pittsfield. (Pittsfield West Quad Sheet)
Pontoosuc	P-1	10.7	Town Brook at Bridge Street, Lanesborough, at USGS stream gage location. (Cheshire Quad)
	P-2	0.9	Town Brook at Rt. 7 bridge, Lanesborough, 3/4 mile south of New Ashford-Lanesborough townline. (Cheshire Quad Sheet)
	P-3	0.6	Unnamed brook, tributary to Town Brook at culvert on entry road to ski area. Station is in New Ashford approximately 200 feet from New Ashford-Lanesborough townline. (Hancock Quad Sheet) Water samples were not collected here because of no streamflow on sampling days.
	P-4	4.9	Town Brook at Rt. 7 bridge, Lanesborough, about 0.7 mile north of Bailey Rd. and Rt. 7 intersection. (Cheshire Quad Sheet)
	P-5	2.4	Unnamed brook, tributary to Town Brook, at Scott Rd. culvert, Lanesborough. (Cheshire Quad Sheet)
	P-6	7.5	Town Brook, Rt. 7 bridge 1,000 feet north of Bailey Rd. and Rt. 7 intersection, Lanesborough. (Cheshire Quad Sheet)
	P-7	12.3	Town Brook at Bull Hill Road bridge, Lanesborough. (Cheshire Quad Sheet)
	P-8	5.8	Secum Brook at Balance Rock Road culvert, Lanesborough. (Hancock Quad Sheet)
	P-9	0.7	Unnamed brook, from Pontoosuc Gardens, at Rt. 7 culvert in Lanesborough. (Pittsfield East Quad Sheet)

Results of the laboratory analyses of water quality samples are presented in Table C-2. All analyses were performed by Berkshire Enviro-Labs, Inc., in Lee, Massachusetts.

Results of selected analyses for specific dates are also presented on the Water Quality Station Diagrams, Figure C-1. These diagrams, which locate the sampling stations in a schematic manner, present the test data on one page so that comparisons between stations can be easily made.

ASHMERE LAKE

WATERSHED WATER QUALITY TESTING

Analysis	Units	Date & Time Collected A-1-1 8-12-80 2:10 a.m.	A-1-2 8-28-80 2:40 p.m.	A-1-3-1 9-18-80 8:30 a.m.	A-1-3-2 9-18-80 10:30 a.m.	A-1-3-3 9-18-80 12:30 p.m.
Water Temp.	°C	18	18	15	15	15
pH		7.8	8.0	7.9	7.8	7.7
Total Phosphorus	mg/l	0.03	0.03	0.04	0.04	0.04
Orthophosphate	mg/l	0.01	0.01	0.00	0.01	0.01
Nitrite-Nitrate-N	mg/l	0.26	0.19	0.35	0.32	0.29
Ammonia - N	mg/l	0.11	0.00	0.04	0.06	0.05
Total Kjeldahl-N	mg/l	0.78	0.39	0.61	0.74	0.51
Suspended Solid	mg/l	0.5	0.25	2.0	1.0	0.5
Fecal Coliform	/100 ml	70	20			

ONOTA LAKE

WATERSHED WATER QUALITY TESTING

Analysis	Units	Date & Time Collected 0-1-1 8-12-80 11:40 a.m.	0-1-2 8-28-80 1:25 p.m.	0-1-301 9-18-80 7:50 a.m.	0-1-3-2 9-18-80 11:02 a.m.
Water Temp.	°C	13.8	14	12	12
pH		7.5	7.6	7.7	7.8
Total Phosphorus	mg/l	.04	.04	.04	.04
Orthophosphate	mg/l	.01	.01	.00	.00
Nitrite-Nitrate-N	mg/l	1.00	1.05	.98	1.06
Ammonia - N	mg/l	.01	.08	.02	.01
Total Kjeldahl N	mg/l	.61	.40	.26	.40
Suspended Solid	mg/l	1.0	1.0	9.0	.5
Fecal Coliform	/100 ml	110	120		

PLUNKETT RESERVOIR

WATERSHED WATER QUALITY TESTING

Analysis	Units	Date & Time Collected PR-1-1 8-12-80 1:40 p.m.	PR-1-2 8-28-80 2:15 p.m.
Water Temp.	°C	18.3	17
pH		7.8	8.0
Total Phosphorus	mg/l	.02	.02
Orthophosphate	mg/l	.01	.01
Nitrite-Nitrate-N	mg/l	.11	.14
Ammonia - N	mg/l	.09	.03
Total Kjeldahl N	mg/l	.81	.39
Suspended Solid	mg/l	.5	.25
Fecal Coliform	/100 ml	110	120

RICHMOND POND

WATERSHED WATER QUALITY TESTING

Analysis	Units	Date & Time Collected R-1-1 8-12-80 3:00 p.m.	R-1-2 8-28-80 12:15 a.m.	R-1-3-1 9-18-80 9:30 a.m.	R-1-3-2 9-18-80 11:30 a.m.
Water Temp.	°C	21.1	23		
pH		7.7	7.8	7.8	7.8
Total Phosphorus	mg/l	.04	.07	.05	.05
Orthophosphate	mg/l	.02	.00	.01	.02
Nitrite-Nitrate-N	mg/l	.15	.08	.15	.11
Ammonia - N	mg/l	.16	.00	.14	.14
Total Kjeldahl N	mg/l	1.10	.60	.59	.58
Suspended Solid	mg/l	2.0	9.5	7.0	2.0
Fecal Coliform	[illegible]	[illegible]	[illegible]		

UPPER HOUSATONIC RIVER

PONTOOSUC LAKE

WATERSHED WATER QUALITY TESTING

Analysis	Units	Date & Time Collected												
		P-2-1 8-12-80 10:30 a.m.	P-2-2 8-28-80 11:15 a.m.	P-4-1 8-12-80 10:50 a.m.	P-4-2 8-28-80 10:10 a.m.	P-4-3-1 9-18-80 8:40 a.m.	P-4-3-2 9-18-80 10:15 a.m.	P-4-4-1 2-11-81 9:10 a.m.	P-4-4-2 2-11-81 11:10 a.m.	P-4-4-3 2-11-81 1:10 p.m.	P-4-4-4 2-11-81 3:15 p.m.	P-5-1 8-12-80 11:15 a.m.	P-5-2 8-28-80 10:30 a.m.	P-5-3-1 9-18-80 9:00 a.m.
Water Temp.	°C	17°	17°	17°	17.5°	14°	14°	2°	2°	1°	1°	16°	16°	13°
pH		7.1	7.2	7.4	7.4	8.1	8.3	6.8	6.9	7.0	7.1	7.5	7.5	8.0
Total Phosphorus	mg/l	0.01	0.03	0.02	0.04	0.04	0.04	0.05	0.10	0.30	0.33	0.04	0.01	0.04
Orthophosphate	mg/l	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.05	0.10	0.10	0.02	0.00	0.00
Nitrite-Nitrate-N	mg/l	0.36	0.04	0.60	0.44	0.60	0.54	0.78	0.78	0.69	0.62	0.51	0.49	0.49
Ammonia - N	mg/l	0.06	0.03	0.06	0.05	0.30	0.04	0.09	0.08	0.19	0.24	0.08	0.08	0.06
Total Kjeldahl-N	mg/l	0.46	0.31	0.39	0.31	0.19	0.31	0.33	0.39	0.71	0.71	0.51	0.29	0.43
Suspended Solid	mg/l	1.0	0.50	0.5	0.25	0.5	0.5	5.6	43	205	233	0.5	0.25	5.0
Fecal Coliform	/100 ml	40	<20	210	20							1900	80	
Estimated Flow	cfs	0.03	0.02											

Analysis	Units	Date & Time Collected						Date & Time Collected				
		P-5-3-2 9-18-80 10:25 a.m.	P-6-1 8-12-80 11:00 a.m.	P-6-2 8-28-80 10:55 a.m.	P-7-1 8-12-80 11:30 a.m.	P-7-2 8-28-80 11:40 a.m.	P-8-1 8-12-80 11:40 a.m.	P-8-2 8-28-80 1:00 p.m.	P-8-3-1 9-18-80 7:30 a.m.	P-8-3-2 9-18-80 10:45 a.m.	P-9-1 8-12-80 12:00 p.m.	P-9-2 8-28-80 11:50 a.m.
Water Temp.	°C	12°	17°	17.5°	20°	23°	14°	15°	12°	13°	23°	18.5°
pH		8.0	7.6	7.5	7.6	7.6	7.8	7.8	8.2	8.2	7.6	7.8
Total Phosphorus	mg/l	0.04	0.02	0.04	0.04	0.05	0.04	0.03	0.04	0.04	0.05	0.06
Orthophosphate	mg/l	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00
Nitrite-Nitrate-N	mg/l	0.48	0.62	0.46	0.24	0.04	0.26	0.24	0.25	0.24	0.22	0.63
Ammonia - N	mg/l	0.11	0.15	0.06	0.16	0.01	0.16	0.00	0.05	0.01	0.09	0.00
Total Kjeldahl - N	mg/l	0.62	0.76	0.53	1.04	0.87	0.56	0.20	0.55	0.37	0.95	0.38
Suspended Solid	mg/l	0.5	0.5	0.25	1.5	1.00	1.0	0.25	1.0	0.5	1.5	9.5
Fecal Coliform	/100 ml		2800	1800	210	<20	100	40			1900	220
Estimated Flow	cfs		2									

UPPER HOUSATONIC RIVER

PONTOOSUC LAKE

WATERSHED WATER QUALITY TESTING

Analysis	Units	Date & Time Collected						Date & Time Collected					
		P-1-1 8-12-80 9:45 a.m.	P-1-2 8-28-80 9:45 a.m.	P-1-3-1 9-18-80 8:15 a.m.	P-1-3-2 9-18-80 10:00 a.m.	P-1-3-A 9-18-80 8:45 a.m.	P-1-3-C 9-18-80 9:45 a.m.	P-1-3 9-18-80 10:45 a.m.	P-1-3 9-18-80 11:45 a.m.	P-1-4-1 2-11-81 9:00 a.m.	P-1-4-2 2-11-81 11:00 a.m.	P-1-4-3 2-11-81 1:00 p.m.	P-1-4-4 2-11-81 3:00 p.m.
Water Temp.	°C	16°	16°	14°	12°	13°				0°	0°	0°	0°
pH		6.8	6.9	7.4	7.7	8.0	8.0	8.0	8.0	6.5	6.6	6.8	6.9
Total Phosphorus	mg/l	0.02	0.03	0.04	0.04	0.06	0.09	0.04	0.04	0.05	0.07	0.42	0.40
Orthophosphate	mg/l	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.10	0.18
Nitrite-Nitrate-N	mg/l	0.60	0.49	0.51	0.50	0.46	0.48	0.48	0.50	0.85	0.85	0.72	0.59
Ammonia - N	mg/l	0.17	0.03	0.19	0.06	0.40	0.10	0.07	0.06	0.09	0.09	0.29	0.32
Total Kjeldahl N	mg/l	0.61	0.28	0.51	0.28	0.86	0.46	0.41	0.34	0.55	0.60	0.97	0.89
Suspended Solid	mg/l	0.5	0.25	0.5	0.5	1.0	0.5	0.5	0.5	3.4	7.0	270	221
Fecal Coliform	/100 ml	1100	140										
Estimated Flow	cfs	2.3	0.9	3.6	3.4	4.0	3.8	3.8	3.6	13	15	58	155

Analysis	Units	Date & Time Collected							Date & Time Collected	
		P-1-5 4-29-81 11:00 p.m.	P-1-5 4-29-81 12:00 mid.	P-1-6 5-12-81 2:15 a.m.	P-1-6 5-12-81 3:15 a.m.	P-1-6 5-12-81 4:15 a.m.	P-1-6 5-12-81 5:15 a.m.	P-1-6 5-12-81 6:15 a.m.	P-1-6 5-12-81 7:15 a.m.	P-1-6 5-12-81 8:15 a.m.
Water Temp.	°C									
pH		7.9	7.9	6.8	7.1	7.2	7.4	7.4	7.4	7.5
Total Phosphorus	mg/l	0.04	0.04	0.10	0.28	0.33	0.27	0.15	0.09	0.07
Orthophosphate	mg/l	0.02	0.02	0.06	0.05	0.07	0.08	0.04	0.02	0.02
Nitrite-Nitrate-N	mg/l	0.56	0.55	0.30	0.28	0.26	0.29	0.28	0.28	0.30
Ammonia - N	mg/l	0.18	0.38	0.08	0.09	0.09	0.11	0.09	0.09	0.08
Total Kjeldahl N	mg/l	3.23	0.68	7.5	8.1	7.5	4.5	5.4	4.5	1.8
Suspended Solid	mg/l	12.0	7.0	114	207	320	220	105	62	40
Estimated Flow	cfs	57	57	60	84	111	124	115	92	76

Fig. C-1

UPPER HOUSATONIC RIVER

SAMPLING DATE: 8-12-80

PARAMETER: Total phosphorus and total nitrogen (phosphorus listed first)

SAMPLING STATIONS

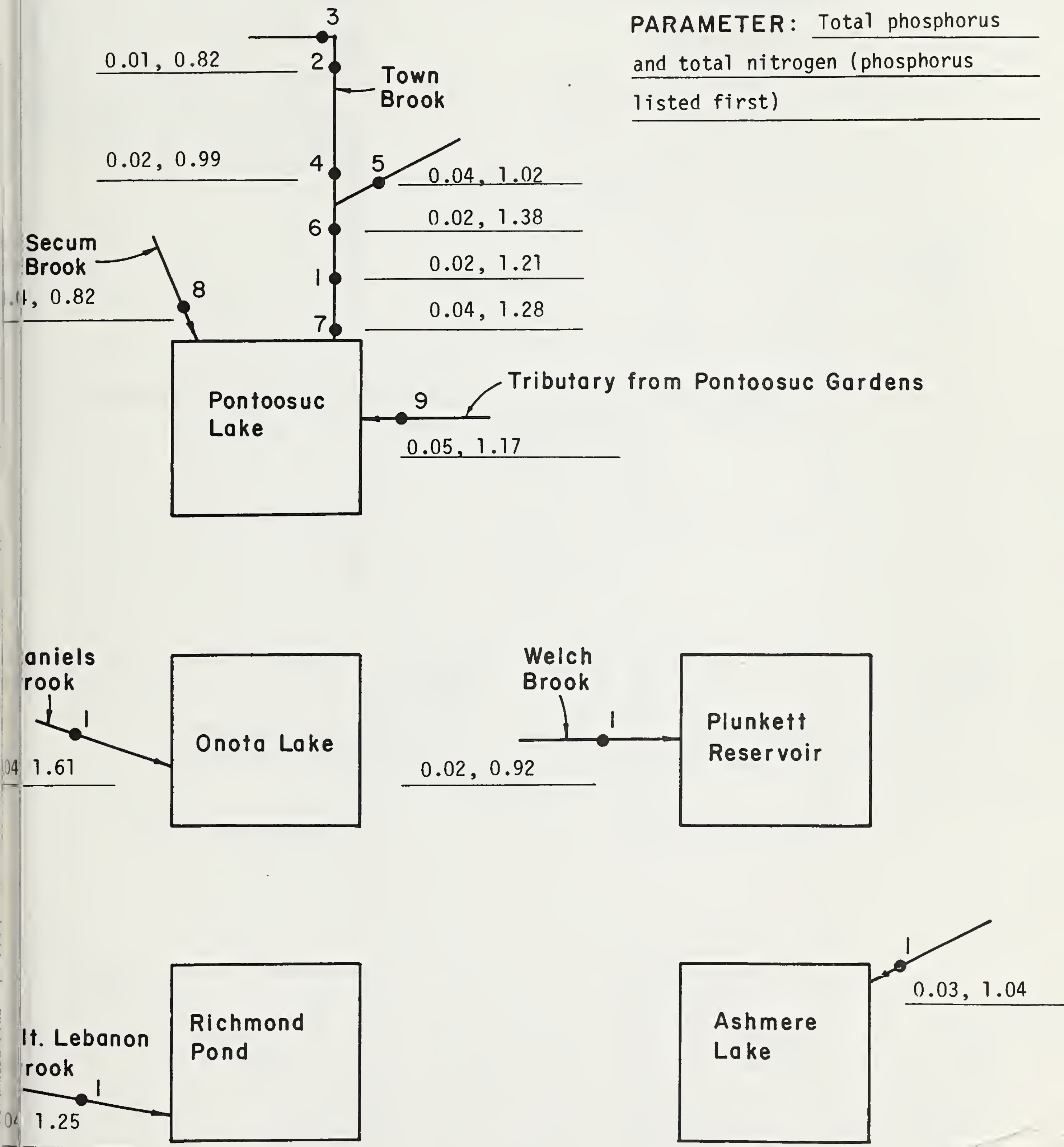


Fig C-1

UPPER HOUSATONIC RIVER

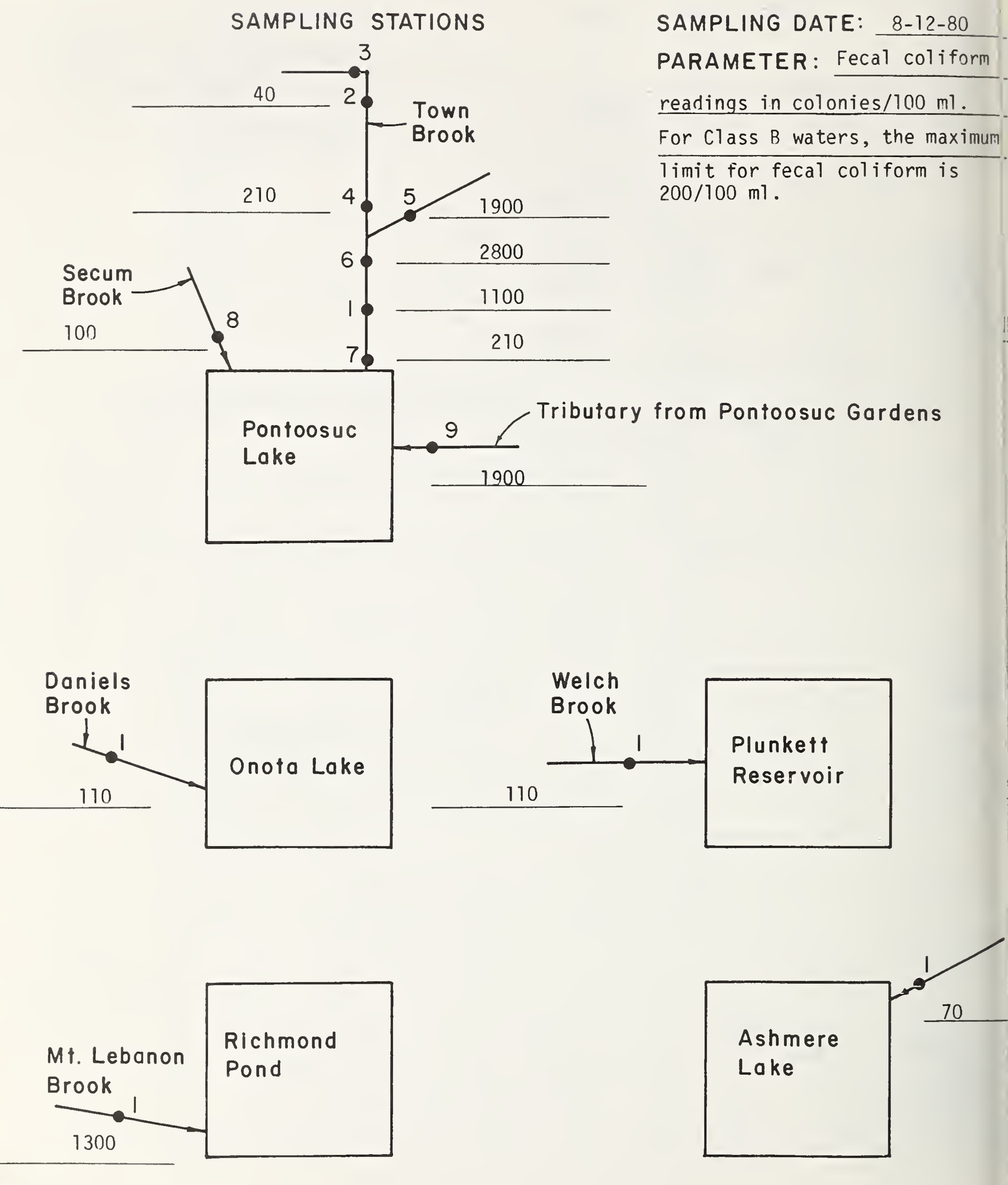


Fig. C-1

UPPER HOUSATONIC RIVER

SAMPLING STATIONS

SAMPLING DATE: 8-28-80

PARAMETER: Total phosphorus and total nitrogen (phosphorus listed first)

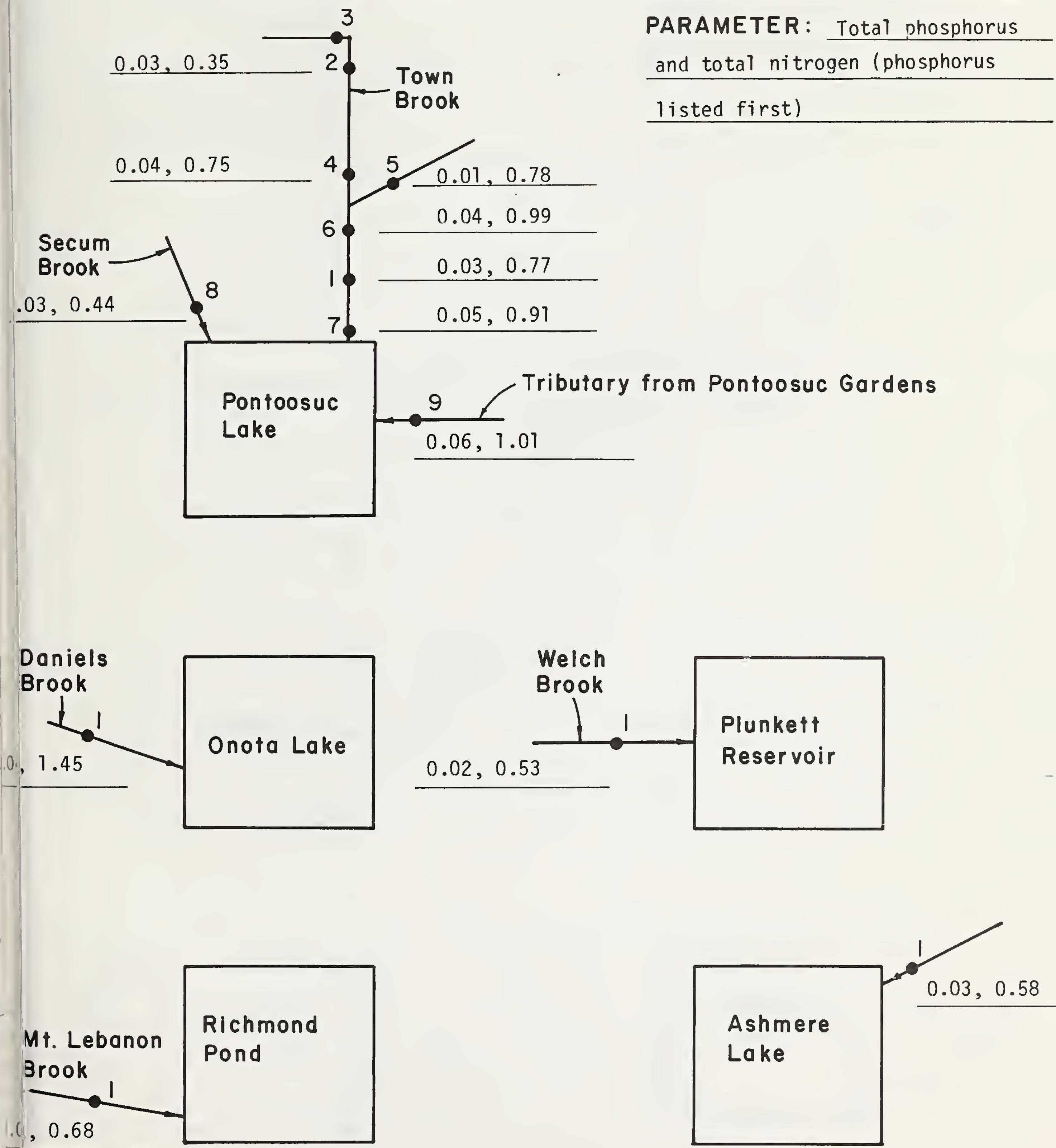


Fig C-1

UPPER HOUSATONIC RIVER

SAMPLING STATIONS

SAMPLING DATE: 8-28-80

PARAMETER: Fecal coliform readings in colonies/100 ml.

For Class B waters the maximum limit for fecal coliform is 200/100 ml.

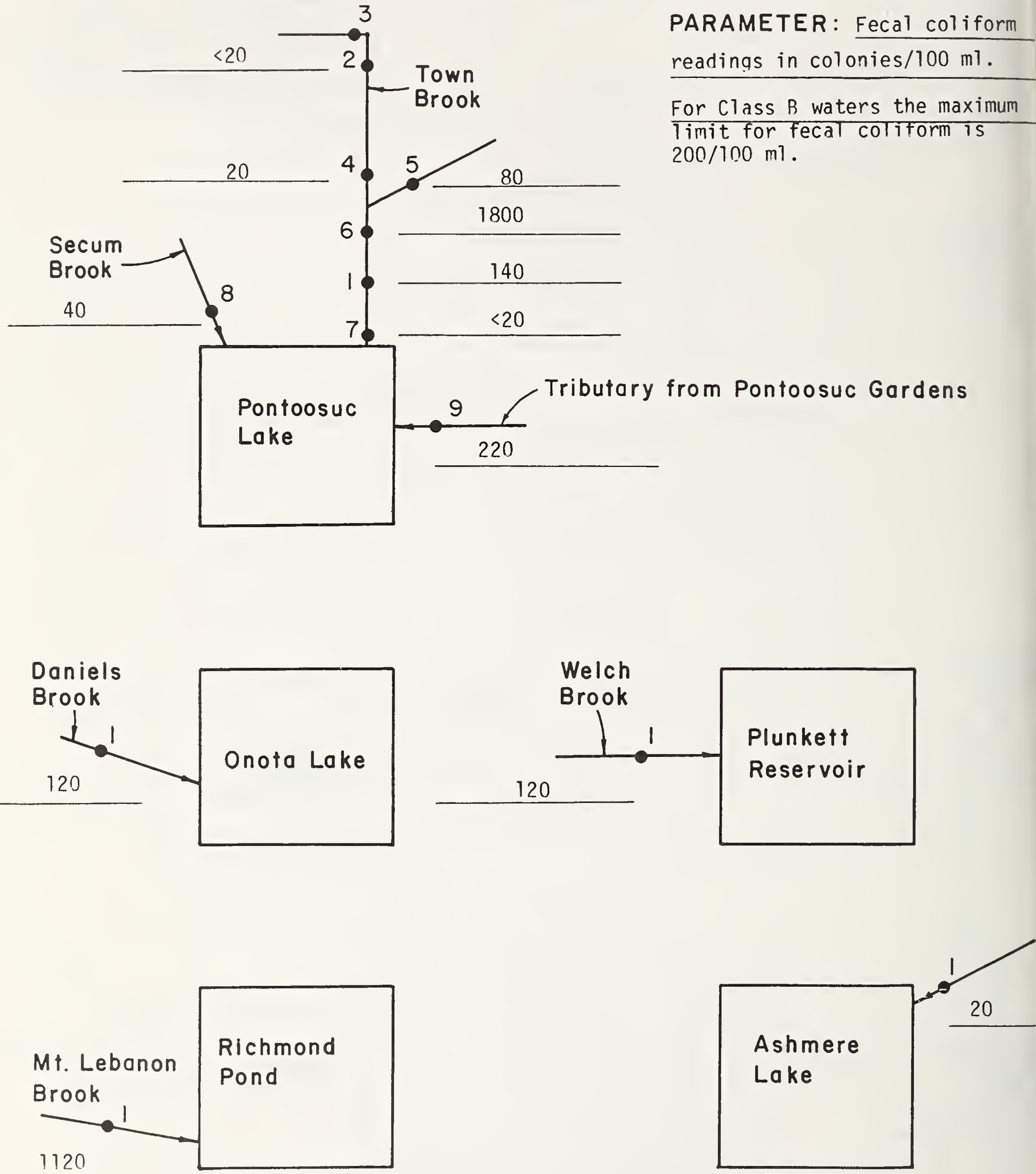


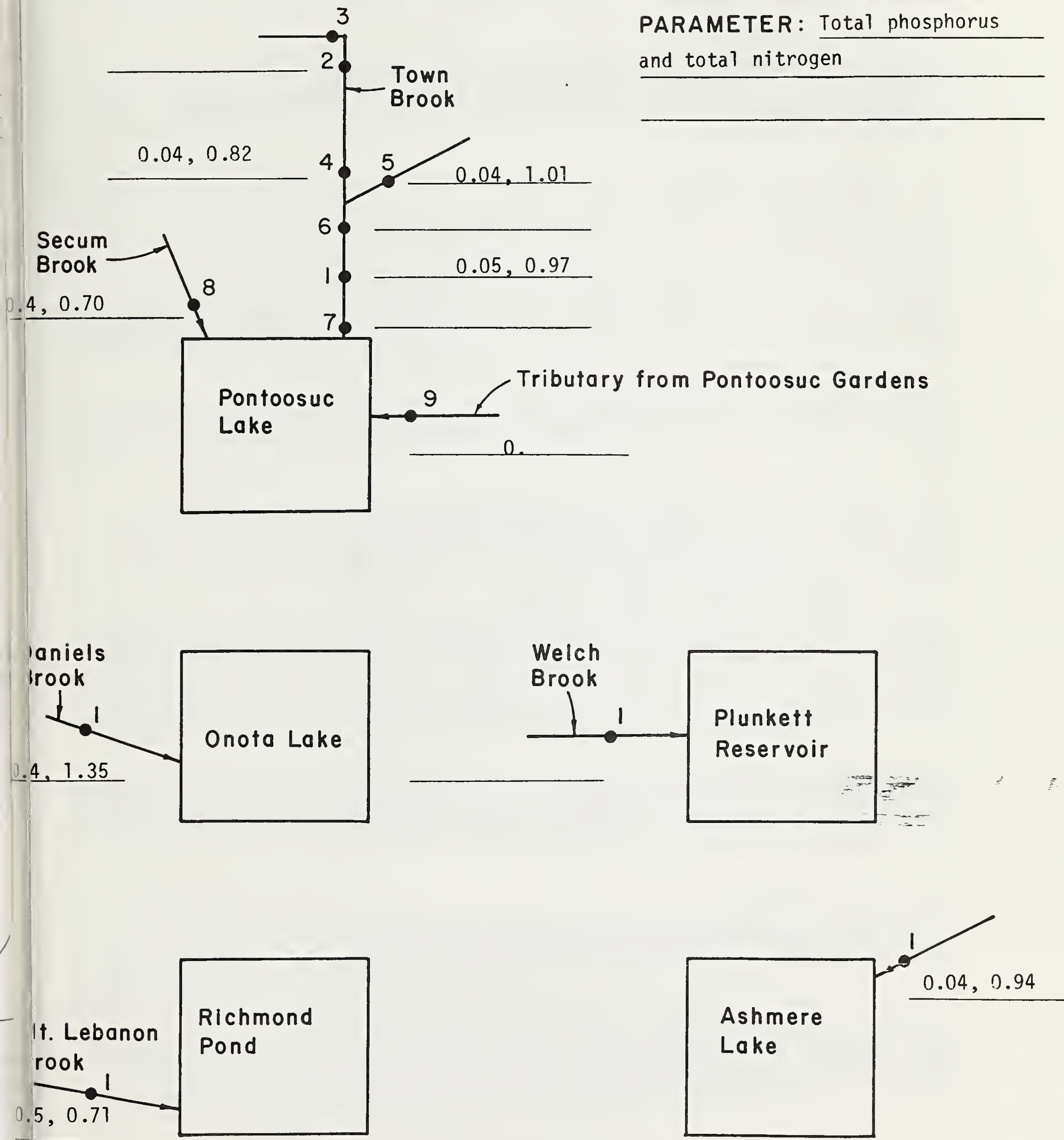
Fig. C-1

UPPER HOUSATONIC RIVER

SAMPLING STATIONS

SAMPLING DATE: 9-12-82

PARAMETER: Total phosphorus and total nitrogen



Low flow, base level samples, were collected on August 12 and 28, 1980 at 12 stations.

Three storm flows were sampled at station P-1, Town Brook at Bridge Street in Lanesborough on September 18, 1980; February 11, 1981; and May 12, 1981.

Although the September 18, 1980 storm was minor, a large number of samples was obtained to determine the effectiveness of the automatic sampler in obtaining suspended solids sediment samples. Samples from the automatic sampler were compared to samples obtained manually with good correlation between the two methods.

The February 11, 1981 storm peak stream flow occurred about four hours after the last sample was collected. The last sample, collected at 3:00 p.m., did show slight reductions in total nitrogen, total phosphorus, and suspended solids concentrations from the data obtained at 1:00 p.m. It appears that these concentrations had peaked even though stream discharge continued to increase until about 7:00 p.m. The stream remained above flood stage for about 24 hours after the peak flow was recorded. Analysis of the February 11, 1981 data was further complicated by ice in the stream channel that caused backwater at the stream gauge and made determination of flood discharges uncertain.

The most complete and usable array of data correlating stream discharge, suspended sediment, and total phosphorus was obtained for the rainstorm of May 12, 1981.

Data collected at the Town Brook, Lanesborough, gauging site indicated that total runoff from the event from midnight through noon of May 12 was 0.14 inches from the contributing drainage area while the stream discharge peak was 126 cubic feet per second.

The May 12 storm delivered 2.54 pounds of total phosphorus per ton of suspended sediment indicating that the suspended sediment contained 0.127 percent total phosphorus. The 208 Water Quality Management Plan (pg. 96-97) estimated that sediment derived from erosion-related sources contained 0.13 percent phosphorus. Studies conducted by SCS in the Black River Watershed of Northern Vermont have resulted in estimates of 2.7 pounds of total phosphorus per ton of sediment.

This phosphorus concentration represents all runoff-related phosphorus from the watershed including the erosion-related phosphorus. Erosion-related phosphorus is estimated to be about 1.5 pounds of total phosphorus (0.68 kilograms) per ton of sediment delivered to the lake.

Fertilizer Use Survey

A telephone survey was conducted in 1982 to determine fertilizer use on the lawns and gardens of residential properties around Onota and Pontoosuc Lakes.

Data were obtained from six properties adjacent to Pontoosuc Lake and from eight properties around Onota Lake. Information developed included: size of property, amount and type of fertilizer used, and frequency of fertilizer application. Eight of the 14 respondents stated that they do not fertilize and the low average rates applied per acre indicated in the following table reflect this.

Table C-3

Fertilizer Application

Lake	Number Sampled	Total Area of Sampled Properties - Ac.	Rate of Fertilizer Application Pounds/Acre/Year 1/				
			Nitrogen	Phosphorus		Potassium	
			as N	as P_2O_5	as P	as K_2O	as K
Pontoosuc	6	2.2	6.1	3.0	1.3	2.0	1.7
Onota	8	86.6	2.4	1.4	0.6	0.9	0.8
Totals	14	88.8	2.4	1.4	0.6	1.0	0.8

1/ Fertilizer is usually labeled by percent nitrogen as N, phosphorus as P_2O_5, and Potassium as K_2O; i.e., 10-10-10.

Using these application rates the estimated phosphorus delivered to these two lakes from non-farm use of fertilizer is as follows:

Table C-4

Phosphorus from Non-farm Use of Fertilizer

Lake	Urban land in Watershed Ac.	Phosphorus Delivered			
		@ 2% Delivery		@ 5% Delivery	
		lbs.	kgs.	lbs.	kgs.
Onota	505	6	3	15	7
Pontoosuc	570	15	8	37	17

The 208 Study report (page 102) states: "Phosphorus supplied by lawn fertilizers was computed to be trivial." The SCS anlaysis of this topic comes to the same conclusion.

Soil Phosphorus Sampling

Five soil samples were collected in the watershed of Pontoosuc Lake and analyzed for phosphorus content. Samples were collected on March 12, 1981 by Soil Conservation Service personnel and analyzed by Lycott Environmental Research, Inc. Results are presented in Table C-5.

The sampling and analysis were done to obtain an estimate of the phosphorus content of soils in the watershed to permit comparisons with suspended sediment analyses and to develop confidence limits for the estimates of total phosphorus attributable to erosion from cropland.

Table C-5

Soil Phosphorus Sampling Results

Sample Description	Phosphorus Content mg/kg	Phosphorus Content Pds. per Ton of soil
A. Crop field - Cropped 2 years continuous corn. Field 100 feet from Secum Brook, south of Balance Rock Rd., Lanesborough, sampled 0 to 6 in. depth.	930	1.86
B. Brushy field border at edge of corn field of Sample A, depth sampled 2 to 8 inches.	235	0.47
C. Field border near Sample D, noncropped till soils on Mt. Greylock, off Rockwell Rd., Lanesborough.	249	0.50
D. Crop field near Rockwell Rd., Lanesborough. Till soil on Mt. Greylock.	10	0.02
E. Brook wash. Recently deposied sediment from swampy area on Town Brook just upstream of Bull Hill Rd., Lanesborough.	225	0.45

Lake Bottom Sediment Samples

In January and February of 1981, samples of Pontoosuc Lake bottom sediments were taken by SCS personnel and analyzed by Lycott Environmental Research, Inc. Results of the testing are presented in Table C-6.

Samples were obtained from both shallow and deep portions of the lake. A fixed-piston core sampler was dropped into the sediment to obtain the sample. After being retrieved, each sample was capped and cooled during transport to the laboratory.

Table C-6

Sample	1	2	3-top	3-bottom
Depth of Water - ft.	19	30	35	35
Percent Moisture	94.1	91.4	92.7	84.9
Percent Organics of Dry Weight	33.8	27.3	24.8	8.5
Total Phosphorus mg/kg	36	110	293	70
Description of Test Preparation	Well blended sample from each tube		Top of tube sample 40 g.	Bottom of tube sample 40 g.

APPENDIX D

PUBLIC PARTICIPATION

Appendix D

PUBLIC PARTICIPATION

It is the policy of the Soil Conservation Service to carry out a strong and effective public participation program in conjunction with River Basin Planning activities. The opportunity for local, state, and other federal agencies, as well as interested individuals, to participate contribute to a well understood plan and enhances the probability of plan implementation.

When local officials and others participate in a study to identify their particular water resource problems, examine the alternatives, and make their own decisions, implementation of the plan becomes a logical extension of the planning process. Public participation strengthens the planning process, keeps the focus on critical local problems, and helps identify solutions that have local support for implementation.

Public participation was encouraged throughout the Upper Housatonic study process. Numerous public meetings were held to obtain public opinion on needs and concerns and to review alternative solutions throughout the planning process.

The dates of the public meetings, pertinent correspondence, and other contacts with a brief description of each follows.

Public Participation

April 4, 1979 - Meeting held at Berkshire County Regional Planning Commission to discuss issues which need to be addressed. Attended by: Corps of Engineers, Soil Conservation Service, Massachusetts Division of Forests and Parks, Berkshire County Regional Planning Commission, Massachusetts Division of Fisheries and Wildlife, Massachusetts Division of Water Resources, Cooperative Extension Service.

April 12, 1979 - Public meeting held at Berkshire Gas Company to obtain citizen input on problems and needs. Attended by: Hinsdale Conservation Commission, Washington Conservation Commission, Hancock Conservation Commission, Pittsfield Recreation Department, Lanesborough Conservation Commission, Berkshire Regional Planning Commission, Lanesborough Planning Board.

April 20, 1979 - Letter from Lanesborough Conservation Commission and Lanesborough Planning Board detailing concerns.

May 14, 1979 - Letter from Hinsdale Conservation Commission detailing concerns.

December 12, 1979 - Letter from Berkshire County Regional Planning Commission regarding review of draft plan of study.

December 19, 1979 - Meeting at Berkshire County Regional Planning Commission to discuss draft plan of study. Attended by Berkshire County Regional Planning Commission, Soil Conservation Service, and Pittsfield Planning Department.

February 29, 1980 - Letter from Berkshire County Regional Planning Commission indicating staff endorsement of plan of study.

March 26, 1980 - Letter from Pittsfield Planning Board endorsing plan of study.

March 26, 1980 - Letter from Berkshire County Regional Planning Commission endorsing plan of study.

May 22, 1980 - Citizen Advisory Group meeting to discuss plan of study. Twenty-five people attended.

June 6, 1980 - Public meeting at Hinsdale School to discuss management problems and opportunities at Ashmere and Plunkett Lakes. Attended by 15 people representing Planning Board, selectmen, Conservation Commission, Division of Forests and Parks, Plunkett Lake Association, and Ashmere Lake Association.

June 10, 1980 - Public meeting at Berkshire County Regional Planning Commission to discuss Pontoosuc and Onota Lakes attended by 28 people.

June 23, 1980 - Public meeting at Richmond Town Hall to discuss Richmond Pond. Attended by 44 people.

January 13, 1981 - First meeting of Pontoosuc Lake Advisory Committee.

January 15, 1981 - First meeting of Onota Lake Advisory Committee.

February 10, 1981 - Pontoosuc Lake Advisory Committee meeting.

February 12, 1981 - Onota Lake Advisory Committee meeting.

March 10, 1981 - Pontoosuc Lake Advisory Committee meeting.

April 14, 1981 - Joint meeting, Onota and Pontoosuc Lake Advisory Committees.

May 19, 1981 - Joint meeting, Onota and Pontoosuc Lake Advisory Committees.

June 16, 1981 - Pontoosuc Lake Advisory Committee meeting.

May 1979 - November 1980 - Land use inventory, and wetland inventory and evaluation completed by citizen groups in Hinsdale and Lanesborough with assistance from Soil Conservation Service.

June 1980 - May 1981 - Water sampling accomplished by citizens in Pittsfield, Lanesborough, and Hinsdale.

December 15, 1981 - A report on the preliminary results of water quality testing was presented at the Pontoosuc Lake Advisory Committee meeting.

December 17, 1981 - Meeting with Berkshire Regional Planning Commission and Berkshire environmental labs to discuss the results of water quality testing.

February 25, 1982 - A review of Pontoosuc Lake report presented at lake association meeting. Requests for comments made.

February 26, 1982 - Richmond Pond report mailed to the public, comments requested.

March 12, 1982 - Reports for Ashmere, Plunkett, and Onota Lakes mailed to the public and comments requested.